Upper Gila Watershed

Watershed Description

The Upper Gila Watershed in Arizona is defined by the Gila River drainage area, from the New Mexico border to Coolidge Dam (San Carlos Reservoir). This 7,354 square mile watershed is occupied by only 51,500 people (2000 census), mostly living in the Safford and Clifton areas. Land ownership is approximately: 47% federal, 28% tribal, 15% state, and 10% private. Agriculture is a primary land use in the Safford area. Outside of this area, land use is primarily open range grazing and recreation, with a minor amount of forestry in the national forests. A major mining facility is located in the Clifton-Morenci area along the San Francisco River. Five wilderness areas and the Gila Box Riparian National Conservation Area are located in this watershed and have restricted uses.

Elevations range from 10,028 feet (above sea level) on Mount Graham to 2,990 feet at Coolidge Dam. Except for a few sky islands (mountains located in the desert), most of the watershed is below 5,000 feet, with low desert flora and fauna and warm water aquatic communities where perennial waters exist.

Water Resources

Precipitation is limited with only 10 inches of rain and up to 2 inches of snow in some locations. Perennial flow is limited to the Gila River above Safford, the San Francisco River and its tributaries, Eagle Creek, portions of Bonita Creek, the San Carlos River, and short segments of tributaries on Mount Graham and in the Chiricahua Mountains. In the Safford area, irrigated agriculture uses a high percentage of the Gila River flow.

An estimate of surface water resources in the Upper Gila Watershed is provided in the following table. Waters on Tribal lands are not assessed by ADEQ; therefore, those statistics are shown separately.

Estimated Surface Water Resources in the Upper Gila Watershed

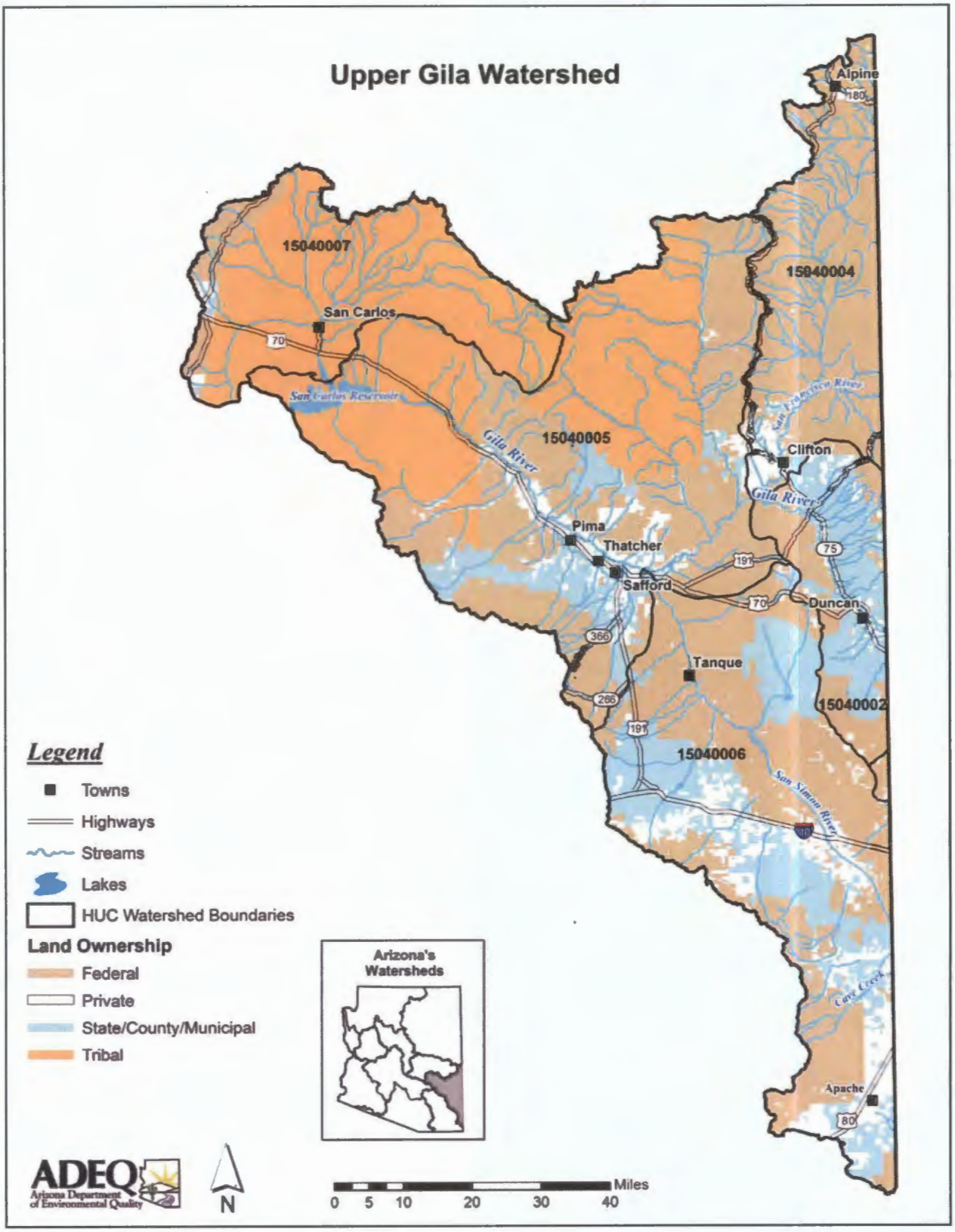
Not on Tribal Land

	Perennial	Intermittent	Ephemeral
Stream miles	445	970	6,305
	Perennial	Non-perennial	
Lake acres	2,289	0	

On Tribal Land – Not Assessed

	Perennial	Intermittent	Ephemeral
Stream miles	105	50	3,795
	Perennial	Non-perennial	
Lake acres	9,523	11,119	

Ambient monitoring focuses on perennial waters; however, special investigations may identify water quality problems on intermittent and even ephemeral waters. Estimated miles and acres are based on USGS digitized hydrology at 1:100,000 and have been rounded to the nearest 5 miles or 5 acres.


Upper Gila Watershed
Alpine
180
15040007
15040004
San Carlos
70
San Carlos Reservoir
Gila River
15040005
San Francisco River
Clifton
Gila River
Pima
Thatcher
191
75
Safford
70
Duncan
366
Tanque
266
15040002
191
15040006
San Simon River
Cave Creek
Apache
80
Legend
Towns
Highways
Streams
Lakes
HUC Watershed Boundaries
Land Ownership
Federal
Private
State/County/Municipal
Tribal
Arizona's Watersheds
ADEQ
Arizona Department of Environmental Quality
N
Miles
0 5 10 20 30 40

Watershed Partnerships

- Gila Watershed Partnership
  The Upper Gila River watershed is about 6,000 square miles, extending from New Mexico to Coolidge Dam and includes the San Carlos Reservation. The objectives of this watershed group are to conserve natural resources, enhance the environment, and maintain or improve the economy and recreational opportunities. It encourages collaboration with both the San Carlos Apache Tribe and southwestern New Mexico. The group meets on the 2nd Tuesday of the month in Safford. Contact Jan Holder (928) 348-4577 or watershedholder@yahoo.com.

- Eagle Creek Watershed Partnership
  This subwatershed within the Gila Watershed Partnership, is also meeting. Its goal is to work together as a community to preserve ranching and rural traditions, improve and preserve the watershed and valuable resources, protect and enhance habitat for wildlife and domestic animals, and find a sustainable economic survival for the community. They meet on the 2nd Friday of month. Contact Chase Caldwell at (480) 635-1245 or chase.caldwell@cox.net.

Special Studies and Water Quality Improvement Projects

Total Maximum Daily Load Analyses – The following TMDL analyses have been completed, are ongoing, or are scheduled to be completed in this watershed. Further information about the status of these investigations or a copy of the TMDL, if completed, can be obtained at ADEQ's website: www.azdeq.gov.

- Cave Creek, from its headwaters to the South Fork of Cave Creek, is impaired by selenium.
  Selenium, at the concentration found, may pose a risk to aquatic life and prey that feed on them, but does not pose a problem to humans even if they consume the fish. A selenium TMDL was initiated in 2006, as this water is classified as a "unique water" or an "outstanding Arizona water" where degradation of water quality is not allowed (i.e., Antidegradation Rule R18-11-107 tier 3 water).

- Blue River was found to be no longer impaired by turbidity based on a TMDL study in 2002.
  ADEQ showed that the lower Blue River, from KP Creek to the San Francisco River, was in compliance with its standards based on 10 years of samples -- 44 samples collected between 1992 through 2001.

- Gila River, upstream of the San Francisco River for 15 miles, is also impaired by selenium.
  Selenium, at the concentration found, may pose a risk to aquatic life and prey that feed on them, but does not pose a problem to humans even if they consume the fish. A selenium TMDL is scheduled to be initiated in 2006.

- Gila River, upstream of Bonita Creek confluence for 6 miles, is impaired by *Escherichia coli* bacteria and suspended sediment.
  Exceedances of the E. coli standard may represent a significant public health concern if people are swimming or even wading in the water. Suspended sediment may negatively impact aquatic communities. The drainage are is nearly 8,000 square miles, so determining the sources of contamination may be complex and is expected to require substantial monitoring data to identify sources. TMDLs are scheduled to be initiated in 2006.

- Luna Lake, near Alpine, is impaired by excess nutrient loading and frequently has not met dissolved oxygen or pH standards.
  Nutrient enrichment may lead to algal blooms, low dissolved oxygen, high pH, and even fish kills. A nutrient TMDL, approved in 2000, indicated that external inputs of nutrients (nitrogen and phosphorus) to the lake, along with current lake nutrient cycling (algae and macrophyte growth and die-offs), have resulted in a highly productive (eutrophic) system that repeatedly fails to meet surface water quality standards. To meet standards watershed management measures are aimed at reductions in nutrient loading from the following sources: septic systems, residential areas, grazing (livestock and wildlife), and macrophyte

decomposition. Reduction in sediment transport is also advised because nutrients are frequently attached to sediments. Several management measures have been initiated in this watershed and monitoring is scheduled to determine their effectiveness.

- San Francisco River, near Luna Lake, is impaired due to suspended sediment.
  Suspended sediment may negatively impact aquatic communities. A TMDL is scheduled to be initiated in 2009.

Water Quality Improvement Grant Projects – ADEQ awarded the following Water Quality Improvement Grants (319 Grants) in this watershed. More information concerning these grants or projects can be obtained at: http://www.azdeq.gov/environ/water/watershed/fin.html.

- **Alpine – Luna Lake Improvement Project**
  Apache County (2001)
  Dredge accumulated sediment and harvest weeds from Luna Lake to decrease nitrogen recycling. Collect water quality samples to help identify faulty septic systems. Provide financial assistance to repair or replace faulty septic systems.

- **Road Rehabilitation in San Simon Wash**
  Coronado Resource Conservation and Development Area (2001)
  Rehabilitate 14 miles of unimproved roads within the watershed using structures to decrease sediment entering the San Simon River. Provide educational materials concerning erosion and sediment controls.

- **Coal Creek Riparian Corridor**
  Apache-Sitgreaves National Forest Clifton Ranger District (2002)
  Restore a 2.5 mile, 265 acre, riparian corridor along Coal Creek. Construct fencing to exclude cattle and wildlife and revegetate using native plants. Site to be used for riparian education field trips for local schools.

- **Maylay Pasture Improvement**
  4 Drag Ranch (2002)
  Rehabilitate riparian area along East Eagle Creek and Robinson Creek by developing an alternative livestock watering source and adding fencing. (Water Protection Fund matching funds)

- **Martinez Ranch Water Quality Improvement Project**
  Hero Consulting (2002)
  Restore riparian conditions along the San Francisco River by fencing to exclude wildlife and cattle, revegetating, and installing erosion control structures. Develop an information kiosk to explain the project's goals and accomplishments.

- **Trees for the Rim Project (2003)**
  Arizona Community Tree Council
  Provide trees and other vegetation at no cost to those private property owners whose trees and landscape plants were destroyed during the Rodeo-Chediski fire in 2002. These actions are to help restore vegetation and thereby reduce runoff pollution.

- **Peterson Wash Stabilization Project**
  Gila Watershed Partnership (2004)
  Rehabilitate Peterson Wash to reduce erosion and sedimentation transport to the Gila River.

- **San Simon Soil Restoration Project**
  Gila Watershed Partnership (2004)
  Restore an area of eroded and unproductive land along the San Simon River by reducing animal impacts in the riparian area.

- **Point of Pines Crossing Rehabilitation Project**
  Gila Watershed Partnership (2004)
  Repair the Point of Pines gate and fencing to reduce stream bank erosion and sediment load caused by livestock, wildlife, and vehicles.

- **Central Detection Dam Rehabilitation Project**
  Gila Watershed Partnership (2005)
  Rehabilitate the Central Detection Dam, a 27-foot high earthen flood control dam built in 1948, which reduces erosion during heavy rainfall. Clean the spillway, remove debris and sediment, clear excessive vegetation in the outlet structure and emergency spillway, and repair damage caused by off-highway vehicles. A fence was installed as a vehicle deterrent, and signage was posted to provide education and outreach.

- **Kaler Ranch Erosion Control Project**
  Gila Watershed Partnership (2005 and 2006)
  Extend and improve road drainage culverts and construct stream bank protection structures along the roads in the San Francisco River drainage. Provide education and outreach for the community.

- **Gila River Clean Up Project**
  Gila Watershed Partnership (2006)
  Remove approximately 6,000 tons of illegally dumped debris along the Gila River.

- **Upper Eagle Creek Watershed Restoration Project**
  Upper Eagle Creek Watershed Partnership (2006)
  Construct fencing and provide alternative water sources for to exclude livestock from Eagle Creek. Apply intensive grazing management techniques such as rotational grazing to reduce erosion and sediment transport.

Water Protection Fund Projects – The following Water Protection Fund Projects were awarded by the Arizona Department of Water Resources. More information about these funds or projects can be obtained from the ADWR web site at: http//www.azwater.gov.

- **Gila Reference Riparian Area Discovery Park Project**
  Mount Graham International Science and Cultural Foundation (2000)
  Propagate native vegetation in a 65 acre area of this 125 acre scientific, historic, and cultural theme park. Continue exotic week eradication in the revegetation areas.

- **Upper Eagle Creek Restoration on Four Drag Ranch Project**
  4 Drag Ranch (2000)
  Rehabilitate the riparian area along East Eagle Creek and Robinson Creek by developing an alternative livestock watering source and adding fencing. Work completed in cooperation with the U.S. Forest Service. (Water Protection Fund matching funds)

- **Georges Lake Riparian Restoration Project**
  National Wild Turkey Federation (2005)
  Rehabilitate Georges Lake, a wet meadow, by fencing out cattle and livestock. Work in cooperation with the U.S. Forest Service, Alpine Ranger District

Other Water Quality Studies – The following additional water quality related studies were completed since 2000 in this watershed.

- ***A Watershed at a Watershed: The Potential for Environmentally Sensitive Area Protection in the Upper San Pedro Drainage Basin (Mexico and USA)***
  Frederick Steiner, Fohn Blair, Laurel McSherry, Subhrajit Guhathakurta, Juaquin Marruffo, Mathew Holm, ASU, School of Planning and Landscape Architecture, Landscape and Urban Planning 49 (2000) 129-148

In the upper San Pedro River rapid urbanization, cattle ranching, and irrigated agricultural pumping in the drainage basin are having negative environmental consequences, including water quality and supply problems, increased soil erosion, threats to wildlife habitats, and degradation of scenic resources. Copper mining, just outside the watershed, potentially impacts ground water and the San Pedro riparian system. This paper focuses on the design of a framework for the identification of environmentally sensitive areas in a watershed and an analysis of existing governmental plans to protect such areas.

- ***Watershed Based Plan for the Campomocho/Sacaton Watershed, a sub-watershed of the Willcox Playa in Southeastern Arizona***
  Campomocho/Sacaton Watershed Group (2002)
  A multi-partner local watershed group identified this area as a high priority focus area for watershed improvements. The primary land use is rangeland, with rural residences and farms just outside the area. Lands ownership is approximately: 85% state, 10% U.S. Forest Service, and 7% private land. Problems identified include soil erosion, poor soil condition, poor vegetative cover, excessive water runoff, sedimentation, reduced forage production, low plant diversity, impaired wildlife habitat, flood damages, and human health and safety concerns. The plan identified management practices that would improve watershed health and water quality.

- ***Walnut Gulch Experimental Watershed – Tombstone, Arizona***
  Southwest Watershed Research Center, USDA, Tucson (2003)
  The Walnut Gulch Experimental Watershed encompasses the 150 square kilometers that surrounds the historical western town of Tombstone in the upper San Pedro Watershed. Research is focused on quantifying the influence of upland conservation on downstream water supply (water appropriation questions) and water quality erosion and soil transport concerns in a normally dry river bed. Research was initiated in the 1950's. Information can be obtained by contacting the research leader at (520) 670-6380 or www.tucson.ars.ag.gov.

- ***Water Quality Data for Selected National Park Units, Southern and Central Arizona and West-Central New Mexico, Water Years 2003 and 2004***
  U.S. Geological Survey in cooperation with the National Park Service (2005)
  Field measurements and water samples were collected at springs, mine adits, streams, and wells at 30 sites in 9 park units in 2003-2004 to provide baseline (ambient) water quality information. Only 24 of the 30 sites were sampled three times due to drought conditions and lack of water during parts of the year.

- ***Status of Federal and State Listed Warm Water Fishes of the Gila River Basin, with Recommendations for Management***
  Desert Fishes Team Report Number 1 (2003)
  This report reviews the status of 12 federal and state listed native warm water fishes in the Gila River basin and the post 1967 recovery and conservation actions taken by all agencies, organizations, or parties.

- ***San Carlos/Safford/Duncan Watershed 10-year Plan***
  Advisory Group for the San Carlos/Safford/Duncan Watershed (currently the Gila Watershed Partnership)
  This plan provides a description of existing conditions and issues in the Upper Gila Watershed, describing on-going, future, and completed projects initiated by this watershed group.

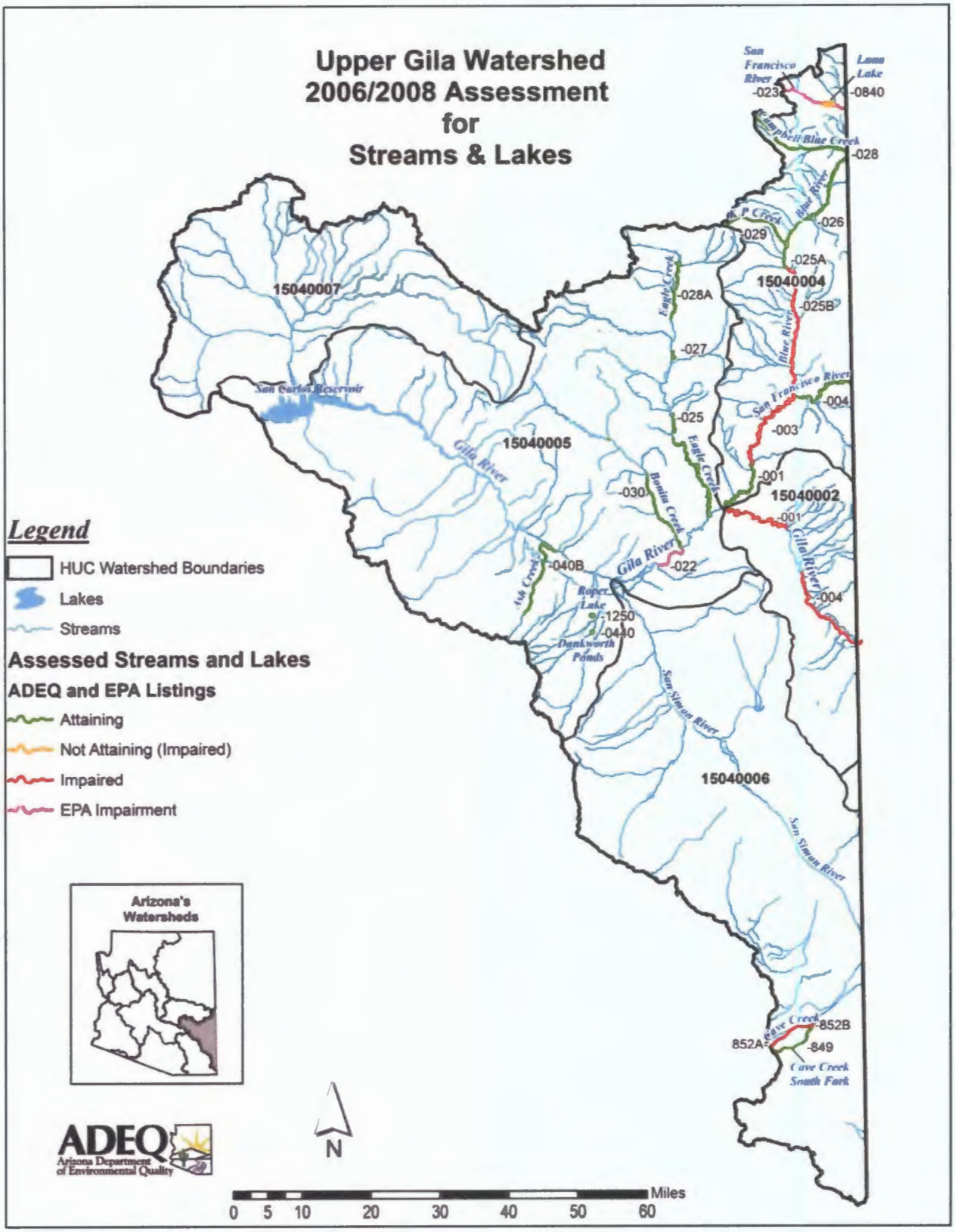
- ***Ambient Surface Water Quality for Rivers and Streams of the Upper Gila River Basin: Water Year 2000***
  Doug McCarty, Steve Pawlowski and Patti Spindler with ADEQ (2004)
  A regional study of ambient surface water quality of the Upper Gila River Watershed was conducted by ADEQ to characterize chemical and biological conditions based on chemical samples, field measurements, and macroinvertebrate bioassessments.

Assessments

The Santa Cruz Watershed can be separated into the following drainage areas (subwatersheds):

15040002	Mangus Creek Drainage Area
15040003	Animas Valley Drainage Area
15040004	San Francisco River Drainage Area
15040005	Upper Gila River Drainage Area
15040006	San Simon River Drainage Area
15040007	San Carlos River Drainage Area (Tribal Land – Not Assessed)

These drainage areas and the surface waters assessed as "attaining" or "impaired" are illustrated on the following watershed map. Methods used to complete these assessments are described in the "Surface Water Assessment Methods and Technical Support" document (2006).


Upper Gila Watershed
2006/2008 Assessment
for
Streams & Lakes
15040007
15040005
15040004
15040002
15040006
San Carlos Reservoir
Gila River
San Francisco River
Blue River
Campbell Blue Creek
Lamp Lake
Eagle Creek
Bonita Creek
Roper Lake
Dankworth Ponds
San Simon River
Cave Creek
Cave Creek South Fork
-023
-0840
-028
-026
-029
-025A
-025B
-028A
-027
-004
-025
-003
-001
-030
-040B
-022
-1250
-0440
-852B
852A
-849
Legend
HUC Watershed Boundaries
Lakes
Streams
Assessed Streams and Lakes
ADEQ and EPA Listings
Attaining
Not Attaining (Impaired)
Impaired
EPA Impairment
Arizona's Watersheds
ADEQ
Arizona Department of Environmental Quality
N
Miles
0 5 10 20 30 40 50 60

ASH CREEK From unnamed tributary at 234537 / 1095222 to Gila River 15040005 – 040B 14.7 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining AgL -- Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 03/16/2000 – 09/29/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At end of Forest Road #307 UGA1H011.08 100830	ADEQ Ambient	3-4 total metals only: Antimony, arsenic, beryllium, cadmium, chromium, copper, and zinc. 4 total and 0-1 dissolved: Boron, manganese, lead, mercury	6 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	5 *E. coli* bacteria 6 Fluoride 6 Total dissolved solids 6 Turbidity 4 Suspended sediment concentration

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	6.0 µg/L A&Ww	09/29/2005 – 3.7 mg/L	Attaining – Low dissolved oxygen due to natural conditions with low flow (0.004 cfs) and ground water source.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and dissolved metals (cadmium, copper, mercury, and zinc) were higher than the A&W chronic criteria in at least 1 sample.
MONITORING RECOMMENDATIONS		Low Priority – Use lower lab detection limit for selenium and dissolved metals.	

BLUE RIVER From New Mexico border to KP Creek 15040004 -- 026 21.4 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Inconclusive FBC – Attaining FC – Inconclusive AgI – Inconclusive AgL – Inconclusive	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 06/13/2000, 09/19/2000, 08/17/2005, 10/26/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Jackson Box UGBLR046.35 100419	ADEQ Ambient	1-2 total and dissolved metals samples: Antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, and zinc. 2 total only: Boron, manganese	3-4samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen, dissolved oxygen and pH	4 *E. coli* bacteria 4 Fluoride 2 Suspended sediment concentration 4 Turbidity
Bobcat Flat UGBLR050.44 101184	ADEQ TMDL		4 Dissolved oxygen and pH samples at each of the 9 sites (36 samples)	4 turbidity 3 Suspended sediment concentration samples at each of the 9 sites
Lazy YJ Ranch UGBLR044.30 101185	ADEQ TMDL			
Below Nolan Creek UGBLR0043.45 101186	ADEQ TMDL			
Above Blue crossing UGBLR0042.52 101188	ADEQ TMDL			
Below Blue crossing UGBLR0041.37 101187	ADEQ TMDL			
Above Balke crossing UGBLR036.37 101189	ADEQ TMDL			
Below Balke crossing UGBLR036.02 101190	ADEQ TMDL			
Above Box UGBLR031.69 101191	ADEQ TMDL			
Below Box UGBLR030.77 101192	ADEQ TMDL			

EXCEEDANCES			
POLLUTANT	STANDARD (UNIT) DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	7.0 mg/L A&Wc	06/13/2000 – 6.0 mg/L 08/17/2005 – 6.5 mg/L	Attaining – Only 2 samples did not meet criterion in 20 samples. (Binomial)

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Missing metals needed to assess A&W, FC, AgI, and AgL		Lab detection limit for selenium was higher than A&Ww chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority: Collect missing core parameters to represent at least 3 seasons. Use lower lab detection limits for selenium.	

BLUE RIVER From KP Creek to Strayhorse Creek 15040004 – 025A 3.8 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Inconclusive FBC – Attaining FC – Inconclusive AgI – Inconclusive AgL – Inconclusive	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 03/29/2000 – 10/25/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below KP Creek UGBLR028.99 100835	ADEQ Ambient	1-2 total and dissolved metals samples: Antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, and zinc. 2 total metals only: Boron, manganese	2-3 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen, dissolved oxygen, and pH	4 *E. coli* bacteria 4 Fluoride 4 Total dissolved solids 2 Suspended sediment concentration 2 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient metal samples to assess FC, AgI, AgL	Only two seasons were represented by samples	Lab detection limit for selenium was higher than A&Ww chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority: Collect missing core parameters to represent at least 3 seasons during the assessment period. Use lower lab detection limits for selenium.	

BLUE RIVER From Strayhorse Creek to San Francisco River 15040004 – 025B 25.4 Miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Inconclusive FBC – Impaired FC – Attaining AgI – Attaining AgL – Attaining	Category 5 Impaired	*E. coli* bacteria	Add *E. coli* bacteria to the 303(d) List.

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 03/28/2000 – 10/25/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Fritz Ranch UGBLR011.55 100835	ADEQ TMDL	4-24 total and dissolved metals samples: Antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, silver, thallium, and zinc. 23 total only: Boron, manganese	23 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen, dissolved oxygen, and pH	20 *E. coli* bacteria 23 Fluoride 21 Total dissolved solids 18 Suspended sediment concentration 24 Turbidity
At Juan Miller Road UGBLR008.19 100398	ADEQ Ambient			
Near Clifton, AZ USGS #09444200 UGBLR008.09 100770	USGS Ambient ADEQ TMDL			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	235 CFU/100 ml FBC	07/28/2004 – 14400 CFU/100 ml 10/27/2004 – 750 CFU/100 ml 08/09/2005 – 620 CFU/100 ml	Impaired -- Three exceedances during the assessment period (out of 20 samples).
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L A&Ww	07/28/2004 – 2700 mg/L 10/27/2004 – 92 mg/L 03/02/2005 – 93 mg/L 08/29/2005 – 109 mg/L	Inconclusive -- 4 of 18 samples exceeded 80 mg/L. One of the results was not included in the geometric mean calculation, because flows were above the 85th percentile of recorded flow (93 mg/L). Using the remaining 17 samples, the geometric mean exceeded 80 mg/L one time. (Two exceedances of the geometric mean are required to list as impaired.)

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Suspended sediment concentration (SSC)	Collected all core parameters		Lab detection limits for selenium and dissolved metals (cadmium, copper, lead, mercury, and zinc) were higher than A&Ww chronic criteria in at least 1 sample.
MONITORING RECOMMENDATIONS		Medium Priority: Collect additional SSC samples due to exceedances. Note that the old turbidity standard (50 NTU) was also exceeded in 2 of 24 field turbidity samples (>999 and 79 NTU). Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted Use lower lab detection limits for selenium and dissolved metals.	

BONITA CREEK From Park Creek to Gila River 15040005 – 030 14.6 Miles Unique Water	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining DWS – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIODS: 01/11/2000 – 05/14/2002; 09/28/2005-12/13/2005 .		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below San Carlos Apache Reservation UGBON014.47 100188	ADEQ Ambient	7 total and dissolved metals samples: Antimony, arsenic, beryllium, cadmium, chromium, copper, lead, and zinc. 4-7 total and 0-1dissolved: Barium, boron, manganese, mercury, nickel, silver, thallium.	11 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	9 *E. coli* bacteria 11 Fluoride 11 Total dissolved solids 1 Suspended sediment concentration 11 Turbidity
Above Gila River UGBON000.17 100185	ADEQ Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and dissolved mercury were higher than A&Ww chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority: Use lower lab detection limits for selenium and dissolved mercury.	

CAMPBELL BLUE RIVER	USE SUPPORT	OVERALL ASSESSMENT	
From headwaters to Blue River 15040004 – 028 19.7 Miles	A&Wc – Attaining FBC – Attaining FC – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 03/28/2000 – 08/28/2001; and 08/16/2005 – 10/26/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above KE Canyon UGCMB004.23 100522	ADEQ Ambient	3-4 total and dissolved metals samples: Antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, and zinc. 4 total and 1-2 dissolved: Chromium, mercury 1-2 total and dissolved samples: Barium, nickel, silver, thallium.	4 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen 11-17 samples: Dissolved oxygen and pH	4 *E. coli* bacteria 5 Fluoride 5 Total dissolved solids 2 Suspended sediment concentration 17 Turbidity
Above Turkey Creek UGCMB002.62 101181	ADEQ TMDL			
Below Turkey Creek UGCMB001.83 101182	ADEQ TMDL			
Above Dry Blue Creek UGCMB000.49 101183	ADEQ TMDL			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	7.0 mg/L A&Wc	07/17/2001 – 5.5 mg/L 08/28/2001 – 6.4 mg/L	Attaining – Low dissolved oxygen results due to natural conditions with ground water upwelling, drought conditions, and very low flows (less than 0.5 cfs).

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and dissolved mercury were higher than A&Ww chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority: Use lower lab detection limits for selenium and dissolved mercury.	

CAVE CREEK From headwaters to South Fork Cave Creek 15040006 – 852A 7.5 Miles Unique Water	USE SUPPORT		OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A D E Q	A&Wc – Impaired FBC – Attaining FC – Attaining AgI – Attaining AgL – Attaining	Category 5 Impaired	Selenium	Selenium listed in 2004.

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/24/2000 – 05/29/2002; and 08/30/2005 – 11/09/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Herb Martyr Campground UGCAV016.84 101108	ADEQ Ambient	4-9 total and dissolved metals: Antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, silver, thallium, and zinc. 4-6 total metals only: Boron, manganese, mercury 1 Selenium	10-12 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	10 *E. coli* bacteria 10 Fluoride 12 Total dissolved solids 1 Suspended sediment concentration 11 Turbidity
Below North Fork Cave Creek UGCAV-014.44 100933	ADEQ Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Selenium	2.0 µg/L A&Wc chronic	01/24/2000 – 6.7 µg/L	Inconclusive – 1 exceedance in this assessment period. Because the lab detection limit (5 µg/L) is higher than the standard (2 µg/L), the other selenium samples collected could not be used to determine attainment.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and dissolved mercury were higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		High Priority – Collect selenium samples to support development of a TMDL Use lower lab detection limit for selenium and dissolved mercury.	

CAVE CREEK	USE SUPPORT	OVERALL ASSESSMENT	
From South Fork Cave Creek to Coronado National Forest boundary 15040006 – 852B 1.5 Miles Unique Water	A&Ww – Attaining FBC – Attaining FC – Attaining AgI – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 04/25/2000 – 12/12/2001 NUMBER AND TYPES OF SAMPLES Metals	Nutrients – Related	Other
Below Coronado Ranger Station UGCAV011.45 100937	ADEQ Ambient	3-4 total and dissolved metals: Antimony, arsenic, barium, beryllium, cadmium, copper, and zinc. 4 total 0-2 dissolved metals: Barium, boron, chromium, lead, manganese, mercury, nickel, silver, thallium.	5 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	5 *E. coli* bacteria 5 Fluoride 5 Total dissolved solids 5 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and dissolved mercury were higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority –Use lower lab detection limit for selenium and dissolved mercury.	

CLUFF RANCH POND #3 15040005 – 0370 15 Acres	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive AgI – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 03/03/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Dam UGCRC-A 102755	AGFD Ambient	1 total metals only: Copper, mercury	1 sample: Dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	0 *E. coli* bacteria 1 Fluoride 1 Total dissolved solids 1 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Insufficient sampling events	Lab detection limit for mercury was higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – Collect missing core parameters to represent at least 3 seasons during the assessment period. Use lower lab detection limit for mercury.	

COLEMAN CREEK From headwaters to Campbell Blue Creek 15040004 – 040 7.3 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Inconclusive FBC – Inconclusive FC – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 08/16/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Turkey Creek UGCOL003.48 100523	ADEQ Ambient	1 total and dissolved metal samples: Antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, and zinc. 1 total metals only: Boron, manganese	1 sample: Dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	1 *E. coli* bacteria 1 Fluoride 1 Total dissolved solids 1 Suspended sediment concentration 1 Turbidity

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Insufficient sampling events	Lab detection limit for selenium was higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – Collect missing core parameters to represent at least 3 seasons during the assessment period. Use lower lab detection limits for selenium.	

DANKWORTH PONDS 15040006 – 0440 8 Acres	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Inconclusive FBC – Inconclusive FC – Attaining	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/15/2000 – 12/22/2000; and 03/03/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Dam UGDAN-A 100018	ADEQ Ambient	3-5 total metals only: Arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, and zinc. 1 total: Selenium, nickel	3-7 samples: Dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	6 Fluoride 7 Total dissolved solids 2 Turbidity
At Pond UGDAN-POND 100988	ADEQ Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Selenium	20 µg/L – A&Wc acute	08/20/2000 – 25 µg/L	Inconclusive –Only 1 sample exceeded the criterion. Very high magnitude of concentration. Because the lab detection limits in 3 other samples were higher than standard, they so could not be used to determine attainment.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Selenium	Insufficient dissolved metals and *E. coli* bacteria to assess A&W and FBC		Lab detection limits for selenium were higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		Medium Priority – Collect selenium data due to the exceedance. Use lower lab detection limit for selenium. Collect missing core parameters to represent at least 3 seasons during the assessment period.	

DIX CREEK From headwaters to San Francisco River 15040004 – 1575 2.3 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 08/08/2005 – 11/02/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above diversion dam UGDIX000.78 103416	ADEQ Ambient	2 total and dissolved metals sample: Antimony, arsenic, beryllium, boron, cadmium, copper, lead, mercury, and zinc. 2 total metals only: Boron, chromium, manganese, selenium	2 samples: Dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	1 *E. coli* bacteria 2 Fluoride 2 Total dissolved solids 2 Suspended sediment concentration 2 Turbidity

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Insufficient sampling events	
MONITORING RECOMMENDATIONS		Low Priority – Collect missing core parameters to represent at least 3 seasons during the assessment period.	

EAGLE CREEK	USE SUPPORT	OVERALL ASSESSMENT	
From headwaters to tributary at 332324 / 1092935 15040005 – 028A 11.8 Miles	A&Ww – Attaining FBC – Attaining FC – Attaining DWS – Attaining AgI – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/12/2000 – 07/25/2000; 08/09/2005 – 11/01/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Honeymoon Campground UGEAG056.85 100535	ADEQ Ambient	3 total and dissolved metals samples: Antimony, arsenic, beryllium, cadmium, copper, lead and zinc. 3 total and 0-2 dissolved: Boron, chromium, manganese, mercury 1 dissolved and total metal: Barium, nickel, silver, thallium.	5 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	4 *E. coli* bacteria 5 Fluoride 5 Total dissolved solids 2 Suspended sediment concentration 3 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and dissolved mercury were higher than A&Ww chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority: Use lower lab detection limits for selenium and dissolved mercury.	

EAGLE CREEK From Willow Creek to Sheeps Wash 15040005 – 027 5.8 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining DWS – Attaining AgI – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/12/2000 – 11/01/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Sheeps Wash UGEAG040.33 100536	ADEQ Ambient	3-7 total and dissolved metals samples: Antimony, arsenic, beryllium, cadmium, chromium, copper, and zinc. 7 total and 2 dissolved: Mercury 1 total and dissolved: Barium, nickel, silver, thallium.	9 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	8 *E. coli* bacteria 9 Fluoride 9 Total dissolved solids 6 Suspended sediment concentration 9 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and dissolved mercury were higher than A&Ww chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority: Use lower lab detection limits for selenium and dissolved mercury.	

EAGLE CREEK From Sheeps Wash to Gila River 15040005 – 025 41.8 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining DWS – Attaining AgI – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/11/2000 – 05/19/2003 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Gold Gulch UGEAG010.12 100806	ADEQ Ambient	4 total and dissolved metals samples: Antimony, arsenic, beryllium, cadmium, chromium, copper, and zinc. 4 total and 0-1 dissolved: Boron, lead, manganese, mercury 1 total and dissolved: Barium, nickel, silver, thallium.	6 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	4 *E. coli* bacteria 6 Fluoride 6 Total dissolved solids 3 Suspended sediment concentration 6 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and dissolved mercury were higher than A&Ww chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority: Use lower lab detection limits for selenium and dissolved mercury.	

EAST TURKEY CREEK From headwaters to terminus (San Simon Wash drainage) 15040006 – 837A 7.8 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Inconclusive FBC – Inconclusive FC – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 08/30/2005, 11/08/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Forest Road #42 UGETK011.80 100545	ADEQ Ambient	1 total and dissolved metal samples: Antimony, arsenic, beryllium, cadmium, and zinc. 1 total metals only: Boron, chromium, copper, lead, manganese, mercury.	1-2 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	2 *E. coli* bacteria 1 Fluoride 1 Total dissolved solids 1 Suspended sediment concentration. 2 Turbidity

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Insufficient monitoring events	Lab detection limits for selenium and dissolved metals (copper, lead, and mercury) were higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – Use lower lab detection limit for selenium and dissolved metals. Collect missing core parameters to represent at least 3 seasons during the assessment period.	

FRYE CANYON CREEK From headwaters to Frye Mesa Reservoir 15040005 – 988A 5.0 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Inconclusive FBC – Inconclusive FC – Inconclusive DWS – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 03/14/2000, 09/27/2000, 09/29/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Forest Road #36 UGFRY009.52 100720	ADEQ Ambient	1 total and dissolved metal samples: Antimony, arsenic, beryllium, cadmium, copper, lead, mercury, and zinc. 1 total metals only: Boron, chromium, manganese	3 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	2 *E. coli* bacteria 3 Fluoride 3 Total dissolved solids 1 Suspended sediment concentration. 3 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Insufficient monitoring events	Lab detection limits for selenium, were higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – Collect missing core parameters to represent at least 3 seasons during an assessment period. Use lower lab detection limit for selenium.	

GILA RIVER From New Mexico border to Bitter Creek 15040002 – 004 16.3 Miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Impaired FBC – Impaired FC – Attaining AgI – Attaining AgL – Attaining	Category 5 Impaired	Suspended sediment concentration (SSC) and *E. coli* bacteria	Add both SSC and *E. coli* bacteria

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 03/15/2000 – 11/30/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Near Duncan UGGLR505.96 USGS #09442000 103656	USGS Ambient	10-15 total and dissolved metals samples: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, and zinc. 1-2 total: Barium, nickel, selenium, silver, thallium.	16-19 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	16 *E. coli* bacteria 16 Fluoride 18 Total dissolved solids 11 Suspended sediment concentration 19 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Copper	500 µg/L – AgL 1300 µg/L – FBC	07/27/2004 – 2800 µg/L	Attaining – Standard was exceeded only once in 12 samples. (Binomial)
Copper (dissolved)	47.3 µg/L at 360 mg/L hardness A&Ww chronic	05/15/2000 – 170 µg/L	Inconclusive – Only 1 exceedance during the assessment period
E. coli bacteria	235 CFU/100 ml FBC	07/28/2004 – 828 CFU/100 ml 10/27/2004 – 5700 CFU/100 ml	Impaired – 2 exceedances in a 3-year period. Results above than the 300 CFU/100 ml screening value.
Lead	15 µg/L – FBC 100 µg/L – AgL	07/28/2004 – 280 µg/L 10/27/2004 – 210 µg/L	Attaining – Only 2 exceedances in 12 samples. (Binomial)
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L A&Ww	11/03/2003 – 92 mg/L – 15 cfs 02/09/2004 – 123 mg/L – 92 cfs* 07/27/2004 – 4560 mg/L – 70 cfs 10/27/2004 – 9400 mg/L – 67 cfs 03/01/2005 – 630 mg/L – 2000 cfs* 05/23/2005 – 85 mg/L – 87 cfs*	Impaired – 6 of 13 samples exceeded 80 mg/L. Three of the results (*) were not included in the geometric mean calculation, because flows were above the 50 Percentile of recorded flow (78 cfs). Using the remaining 10 samples, the geometric mean exceeded 80 mg/L two times.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		
MONITORING RECOMMENDATIONS		High Priority: Collect SSC and *E. coli* bacteria data to support development of TMDLs. Note that the old turbidity standard (50 NTU) was also exceeded in 7 of 12 field turbidity samples. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

GILA RIVER From Skully Creek to San Francisco River 15040002 – 001 15.2 Miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Impaired FBC – Inconclusive FC – Attaining AgI – Attaining AgL -- Attaining	Category 5 Impaired	Selenium	Added selenium in 2004

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 03/13/2000 – 11/29/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Safford Bridge UGGLR471.49 100809	ADEQ Ambient	10-15 total and dissolved metals samples: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, and zinc. 1-2 total: Barium, nickel, selenium, silver, thallium.	16-19 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	16 *E. coli* bacteria 16 Fluoride 18 Total dissolved solids 11 Suspended sediment concentration 19 Turbidity

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Copper (dissolved)	15.9 µg/L at 140 mg/L hardness A&Ww acute	05/13/2003 – 98 µg/L	Inconclusive – One exceedance during the assessment period. Total copper in this sample was reported as <10 µg/L; therefore, this dissolved copper result has low reliability.
Dissolved oxygen	6.0 mg/L A&Ww	08/02/2002 – 5.6 mg/L	Attaining – Standard was not met only once in 17 samples. (Binomial)
E. coli bacteria	235 CFU/100 ml FBC	07/26/2004 – 4300 CFU/100 ml	Inconclusive – One exceedance during the last 3 years of monitoring.
Lead	15 µg/L – FBC 100 µg/L – AgL	8/12/2002 – 110 µg/L 7/26/04 – 79 µg/L	Attaining – Only 2 exceedances in 16 samples. (Binomial)
Selenium	2 µg/L A&Ww chronic	08/12/2002 – 7 µg/L 10/30/2002 – 5 µg/L	Remains impaired -- 2 exceedances in a 3-year period. (Lab detection limits in 16 other samples were higher than standard, so could not be considered for this assessment.)
Suspended sediment concentration	Geometric mean 80 mg/L A&Ww	02/10/2004 – 113 mg/L – 110 cfs 07/26/2004 – 17,200 mg/L – 175 cfs 03/03/2005 – 672 mg/L – 1100 cfs 08/04/2005 – 323 mg/L – 36 cfs	Inconclusive – 4 of 11 samples exceeded 80 mg/L. Normal flow data was not available at this site; therefore, a geometric mean of at least 4 consecutive SSC readings at normal flow could not be calculated. (Note that the old turbidity standard (50 NTU) was also exceeded in 6 of 16 field turbidity samples.)

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	**MISSING CORE PARAMETERS**	**MISSING SEASONAL DISTRIBUTION**	**DETECTION LIMITS NOT LOW ENOUGH**
E. coli bacteria, dissolved copper, and suspended sediment concentration	Collected all core parameters		Lab detection limits for selenium were higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		High Priority: Collect selenium data to support development of a TMDL Collect dissolved copper, suspended sediment concentration, and *E. coli* bacteria data due to exceedances. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted Use lower lab detection limit for selenium.	

GILA RIVER From Bonita Creek to Yuma Wash 15040005 – 022 5.8 Miles	USE SUPPORT		OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A D E Q	A&Ww – Inconclusive FBC – Impaired FC – Attaining AgI – Attaining AgL – Attaining	Category 5 Impaired	*E. coli* bacteria	Added *E. coli* bacteria in 2004.
	E P A	A&Ww – Impaired	Category 5 Impaired	Sediment	EPA added sediment in 2004.

Light blue highlights indicate EPA impairments based on EPA assessment and listing criteria. This listing may change when EPA reviews and approves the 2006/2008 impaired waters list. Such listings do not satisfy requirements established in ADEQ's Impaired Water Identification Rule; therefore, they are not included in the list of ADEQ's Impaired waters (Appendix B and Appendix C).

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 08/30/2000 – 08/11/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Bonita Creek UGGLR452.43 100814	ADEQ Ambient	18-20 total and dissolved metals samples: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, and zinc.	19-20 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	19 *E. coli* bacteria 1 Fluoride 1 Total dissolved solids 20 Suspended sediment concentration 19 Turbidity
At head of Safford Valley USGS #0948500 UGGLR448.61 100729	USGS Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Copper (dissolved)	7.7 µg/L at 177 mg/L hardness A&Ww chronic	10/13/2000 – 9 µg/L	Attaining – Only 1 exceedance during the assessment period.
E. coli bacteria	235 CFU/100 ml FBC	08/30/2000 – 2300 CFU/100 ml 10/13/2000 – 2100 CFU/100 ml 08/11/2004 – 350 CFU/100 ml	Remains impaired -- 3 exceedances during the assessment period.
Lead	15 µg/L FBC	08/30/2000 – 94 µg/L 10/13/2000 – 46 µg/L 08/11/2004 – 20.2 µg/L	Attaining – Only 3 exceedances in 20 samples. (Binomial)
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L A&Ww	08/30/2000 – 6410 mg/L – 334 cfs* 10/13/2000 – 3060 mg/L – 3220 cfs* 03/28/2001 – 88 mg/L – 578 cfs* 09/06/2001 – 197 mg/L – 149 cfs 08/22/2002 – 579 mg/L – 103 cfs 03/27/2003 – 150 mg/L – 628 cfs* 09/10/2003 – 473 mg/L – 74 cfs 03/28/2004 –313 mg/L – 545 cfs* 08/11/2004 – 884 mg/L – 162 cfs	Inconclusive -- 9 of 20 samples exceeded 80 mg/L. Five of the results (*) were not included in the geometric mean calculation, because flows were above the 50th Percentile of recorded flow (176 cfs). Using the remaining 15 results, the geometric mean exceeded 80 mg/L 1 time.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	**MISSING CORE PARAMETERS**	**MISSING SEASONAL DISTRIBUTION**	**DETECTION LIMITS NOT LOW ENOUGH**
	Collected all core parameters		Lab detection limits for dissolved mercury were higher than A&Ww chronic criteria.
DISCUSSION OF SUSPENDED SEDIMENT IMPAIRMENT		Evidence of potential sediment impairment: 1. Only exceeded geometric mean standard once (using a minimum of 4 consecutive samples, and excluding data collected during higher flows); 2. During higher flows, suspended sediments were measured as high as 6410 mg/L; and 3. Suspended sediment routinely exceeds the 80 mg/L criteria (9 of 20 samples), which seems to indicate a high level of sediment transport.	
MONITORING RECOMMENDATIONS		High Priority: Collect suspended sediment and *E. coli* data to support development of TMDLs. Note that the old turbidity standard (50 NTU) was also exceeded in 7 of 19 field turbidity samples. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted. Use lower lab detection limits for dissolved mercury.	

KP CREEK From headwaters to Blue River 15040004 – 029 12.1 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Attaining FBC – Attaining FC – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 03/29/2000 – 10/25/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Blue River UGKPK000.12 100889	ADEQ Ambient	3-6 total and dissolved metals: Antimony, arsenic, barium, beryllium, cadmium, chromium, copper, and zinc. 6 total and 0-1 dissolved: Boron, lead, manganese, and mercury	7-9 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	6 *E. coli* bacteria 8 Fluoride 9 Total dissolved solids 6 Suspended sediment concentration 9 Turbidity

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	7.0 mg/L A&Wc	09/19/2000 – 6.65 mg/L	Attaining – Low dissolved oxygen due to natural conditions and ground water upwelling. Low stream flow (0.01 cfs).

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and dissolved copper were higher than the A&W chronic criteria in at least 2 samples.
MONITORING RECOMMENDATIONS		Low Priority –Use lower lab detection limit for selenium and dissolved copper.	

LUNA LAKE 15040004 -- 0840 120 Acres	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Wc – Impaired FBC – Impaired FC – Inconclusive AgL – Impaired	Category 4A Not attaining	Low dissolved oxygen, high pH, narrative nutrients	TMDL completed in 2000.

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 08/17/2001 – 11/03/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At dam UGLUN-A 100036	ADEQ Ambient HERO Consulting 319 Grant	2 total metal samples only: Antimony, arsenic, barium, boron, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.	4 samples: Ammonia, nitrite/nitrate, total Kjeldahl nitrogen 44-49 samples: Dissolved oxygen and pH 25 samples: total nitrogen and total phosphorus.	2 *E. coli* bacteria 4 Fluoride 3 Total dissolved solids 5 Turbidity
Mid lake UGLUN-B 100979	ADEQ Ambient HERO Consulting 319 Grant			
North of fishing dock UGLUN-2 103292	HERO Consulting 319 Grant			
South of fishing dock UGLUN-1	HERO Consulting 319 Grant			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	7.0 mg/L A&Wc	08/17/2001 – 4.0 mg/L 08/26/2001 – 6.4 mg/L 07/15/2002 – 3.1 mg/L 07/28/2002 – 2.0 mg/L 08/13/2002 – 3.4 mg/L	Remains impaired -- 5 of 11 samples at one site (mid lake) in the upper meter of water had low dissolved oxygen. (Binomial)
pH	<9.0 SU A&Wc, FBC, AgL	08/17/2001 – 9.3 SU 08/26/2001 – 9.4 SU 11/11/2001 – 9.3 SU 06/17/2002 – 9.5 SU 06/15/2002 – 9.4 SU	Remains impaired -- 5 of 11 samples at one site (mid lake) in the upper meter of water had high pH. (Binomial)
Lead	15 µg/L FBC	11/03/2004 – 20 µg/L	Inconclusive -- 1 of 2 lead samples exceeded standards. (Binomial)

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Lead	Insufficient metals samples to assess FC, and AgL	Missing seasonal distribution	
MONITORING RECOMMENDATIONS		Medium Priority – Collect samples during critical conditions to determine the effectiveness of TMDL strategies in the watershed. Low dissolved oxygen and high pH may be symptoms of excess nutrient loading. New methods for implementing the narrative nutrient standard should be applied to this lake once adopted, to determine whether narrative nutrient violations are occurring based on the pH and dissolved oxygen violations. Collect lead samples due to exceedance. Collect missing core parameters.	

NORTH FORK CAVE CREEK From headwaters to Cave Creek 15040006 -- 856 5.6 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Inconclusive FBC – Inconclusive FC – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 08/30/2005, 11/09/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Cave Creek UGNCV000.04 101129	ADEQ Ambient	1 total and dissolved metals sample: Arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, and zinc. 1 total metal only: Boron, manganese.	1-2 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	2 *E. coli* bacteria 1 Fluoride 2 Total dissolved solids 1 Suspended sediment concentration 2 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	7 mg/L A&Wc	08/30/2005 – 6.4 mg/L	Attaining – Naturally occurring low dissolved oxygen due to ground water upwelling and very low flows (less than 1 cfs).

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Insufficient sampling events	Lab detection limits for selenium and dissolved mercury were higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – Use lower lab detection limits for selenium and dissolved mercury. Collect missing core parameters to represent at least 3 seasons during the assessment period.	

ROPER LAKE 15040006 -- 1250 25 Acres	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Attaining	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/16/2000 – 11/22/2000; 05/04/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Dam UGROP-A 100080	ADEQ Ambient and TMDL	3-5 total metals only: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, and zinc. 1 Selenium, nickel	8-11 samples: Dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	8 Fluoride 8 Total dissolved solids 3 Turbidity
Mid lake UGROP-B 100975	ADEQ and AGFD Ambient and TMDL			
At canal UGROP-CANAL 100978	ADEQ TMDL			
At pond UGROP-POND 100976	ADEQ TMDL			
At boat ramp UGROP-BR 102762	ADEQ and AGFD Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient dissolved metals (cadmium, copper, and zinc) and *E. coli* bacteria to assess A&W and FBC		Lab detection limit for selenium was higher than the A&W chronic criterion.
MONITORING RECOMMENDATIONS		Low Priority – Use a lower lab detection limit for selenium. Collect missing core parameters to represent at least 3 seasons during the assessment period.	

SAN FRANCISCO RIVER From headwaters to New Mexico border 15040004 -- 023 13.1 Miles	USE SUPPORT		OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A D E Q	A&Wc – Attaining FBC – Attaining FC – Attaining AgI – Attaining AgL – Attaining	Category 1 Attaining all uses		
	E P A	A&Wc – Impaired (Affected use only)	Category 5 Impaired		EPA added sediment in 2004 (See discussion below)

Light blue highlights indicate EPA impairments based on EPA assessment and listing criteria. This listing may change when EPA reviews and approves the 2006/2008 impaired waters list. Such listings do not satisfy requirements established in ADEQ's Impaired Water Identification Rule; therefore, they are not included in the list of ADEQ's Impaired waters (Appendix B and Appendix C).

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 03/28/2000 – 10/26/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Luna Lake UGSFR151.22 100381	ADEQ Ambient	9-14 total and dissolved metals samples: Antimony, arsenic, beryllium, cadmium, chromium, copper, lead, manganese, and zinc. 4 total samples: Barium, boron, nickel, silver, thallium. 16 total and 4 dissolved: Mercury	14 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen 27 samples: Dissolved oxygen and pH	13 *E. coli* bacteria 15 Fluoride 15 Total dissolved solids 9 Suspended sediment concentration 11 Turbidity
Below dam spillway UGSFR149.44 103293	HERO Consulting 319 Grant		12 samples: temperature and pH	

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	7.0 mg/L FBC	12/29/2004 – 5.0 mg/L 06/08/2005 – 5.0 mg/L	Attaining – Naturally occurring low dissolved oxygen as stream was drying down to relatively stagnant pools.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium were higher than A&Ww chronic criteria.
SUSPENDED SEDIMENT AND TURBIDITY		Evidence of potential sediment impairment: 1. Suspended sediment concentration (SSC) criterion of 80 mg/L was *not* exceeded in 18 samples (9 sampling events); therefore, ADEQ assessed as 'attaining;" 2. SSC values ranged between non-detect to 18 mg/L and would not exceed the proposed standard of 25 mg/L; and 3. The old turbidity standard (10 NTU) was exceeded in 11 of 15 samples; however, the maximum turbidity value was 29 NTU.	
MONITORING RECOMMENDATIONS		Medium Priority: Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted. Use lower lab detection limits for selenium.	

SAN FRANCISCO RIVER From New Mexico border to Blue River 15040004 -- 004 20.9 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Inconclusive FC – Attaining AgI – Attaining AgL – Attaining	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 03/27/2000 – 11/02/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Near Martinez Ranch UGSFR0034.57 100834	USGS Ambient	3-7 total and dissolved metals samples: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, and zinc. 1 total sample: Barium, nickel, silver, thallium. 4 total and 1 dissolved: Mercury	9 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	6 *E. coli* bacteria 9 Fluoride 9 Total dissolved solids 6 Suspended sediment concentration 9 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	235 CFU/100 ml FBC	08/08/2005 – 630 CFU/100 ml	Inconclusive – Only 1 exceedance within the assessment period. Elevated flow and slightly elevated nutrients.
Suspended sediment concentration	Geometric mean 80 mg/L A&Ww	08/08/2005 – 343 mg/L	Attaining – 1 of 6 samples exceeded the SSC criterion (80 mg/L); however, the geometric mean standard was not exceeded.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and dissolved mercury were higher than A&Ww chronic criteria in at least 2 samples.
MONITORING RECOMMENDATIONS		Medium Priority: Collect *E. coli* bacteria data due to exceedance. Note that the old turbidity standard (50 NTU) was exceeded once also (at 74 NTU) when SSC was exceeded. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted. Use lower lab detection limits for selenium and dissolved mercury.	

SAN FRANCISCO RIVER From Blue River to Limestone Gulch 15040004 -- 003 18.7 Miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Inconclusive FBC – Impaired FC – Attaining AgI – Attaining AgL – Attaining	Category 5 Impaired	*E. coli* bacteria	Add *E. coli* bacteria to 303(d) List.

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/10/2000 – 11/30/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Clifton, AZ UGSFR019.04 100708	ADEQ Ambient	12-24 total and 7-24 dissolved metals samples: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, and zinc. 7 total metals only: Barium, nickel, silver, and thallium.	23-24 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	21 *E. coli* bacteria 24 Fluoride 24 Total dissolved solids 13 Suspended sediment concentration 24 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	235 CFU/100 ml FBC	08/13/2002 – 500 CFU/100 ml 07/27/2004 – 480 CFU/100 ml	Impaired – 2 exceedances within the assessment period. Nutrients were very elevated (0.5-1.2 mg/L nitrogen, 0.3-1.2 mg/L phosphorus).
Mercury (dissolved)	0.6 µg/L FC	12/10/2002 – 0.75 µg/L	Inconclusive – Only 1 exceedance during the assessment period. Result in a duplicate sample taken that day was <0.5 µg/L
Suspended sediment concentration	Geometric mean 80 mg/L A&Ww	07/27/2004 – 188 mg/L	Attaining – 1 of 13 samples exceeded the SSC criterion (80 mg/L); however, the geometric mean standard was not exceeded.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Dissolved mercury	Collected all core parameters		Lab detection limits for selenium and dissolved metals (lead and mercury) were higher than A&Ww chronic criteria in at least 2 samples.

MONITORING RECOMMENDATIONS	
	High Priority: Collect *E. coli* bacteria to support TMDL development. Collect dissolved mercury due to the exceedance. Use lower lab detection limits for selenium and dissolved metals. Note that the old turbidity standard (50 NTU) was exceeded on four dates (>999 NTU, 143, 187, and 59 NTU). Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.

SAN FRANCISCO RIVER From Limestone Gulch to Gila River 15040004 -- 001 12.8 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Inconclusive FC – Attaining AgI – Attaining AgL – Attaining	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/10/2000 – 11/30/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Clifton, AZ UGSFR006.42 USGS #0944500 100382	USGS Ambient	5-28 total and dissolved metals samples: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, and zinc. 7-8 total metals only: Barium, nickel, silver, thallium.	22-24 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	21 *E. coli* bacteria 24 Fluoride 22 Total dissolved solids 13 Suspended sediment concentration 23 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	235 CFU/100 ml FBC	08/13/2002 – 545 CFU/100 ml	Inconclusive – Only 1 exceedance within the assessment period. Very elevated nutrients on that date (1.94 mg/L nitrogen, 1.6 mg/L phosphorus) and lead exceedance occurred on the same date (normal flow.)
Lead	15 µg/L FBC	08/13/2002 – 35 µg/L	Attaining – Only 1 exceedance in 24 samples. (Binomial)
Suspended sediment concentration	Geometric mean 80 mg/L A&Ww	09/18/2003 – 87 mg/L 07/28/2004 – 161 mg/L	Attaining – 2 of 13 samples exceeded the SSC criterion (80 mg/L); however, the geometric mean standard was not exceeded.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
E. coli bacteria	Collected all core parameters		Lab detection limits for selenium and dissolved mercury were higher than A&Ww chronic criteria in at least 12 samples.
MONITORING RECOMMENDATIONS		Medium Priority: Collect *E. coli* bacteria data due to exceedance. Note that old turbidity standard (50 NTU) was exceeded on four dates. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted. Use lower lab detection limits for selenium and dissolved mercury.	

SOUTH FORK CAVE CREEK From headwaters to Cave Creek 15040006 -- 849 8.1 Miles Unique Water	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Attaining FBC – Attaining FC – Attaining AgI – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/24/2000 – 12/12/2001; 08/29/2005 – 11/09/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above South Fork Campground UGSCV002.56 100018	ADEQ Ambient	3-6 total and dissolved metals: Antimony, arsenic, beryllium, cadmium, chromium, copper, lead, silver, thallium, and zinc. 4-6 total metals only: Barium, boron, manganese, mercury	7-8 samples: Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	8 *E. coli* bacteria 6 Fluoride 8 Total dissolved solids 1 Suspended sediment concentration 8 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	7.0 mg/L A&Wc	01/24/2000 – 5.4 mg/L 05/30/2000 – 5.5 mg/L 12/12/2001 – 4.6 mg/L 08/29/2005 – 6.3 mg/L 11/09/2005 – 6.5 mg/L	Attaining – Low dissolved oxygen levels are naturally occurring due to ground water upwelling and very low flows (<0.5 cfs). Very low nutrients.
E. coli bacteria	235 CFU/100 ml FBC	07/11/ 2000 – 240 CFU/100 ml	Attaining – 3 years of monitoring after the exceedance with no further exceedances. (Note exceedance was not above the screening value of 300 CFU/ 100 ml.)

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and dissolved metals (copper, lead, and mercury) were higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – Use lower lab detection limit for selenium and dissolved metals. Old turbidity standard was exceeded only 1 of 8 samples (July 11, 2000 at 35 NTU). Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

TURKEY CREEK From headwaters to Campbell Blue Creek 15040004 – 060 4.6 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Inconclusive FBC – Inconclusive FC – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 10/30/2002 (field measurements on other dates)		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Campbell Blue UGTRY000.18 101180	ADEQ TMDL	1 total and dissolved metal samples: Antimony, arsenic, beryllium, cadmium, copper, lead, mercury, and zinc. 1 total metals only: Boron, chromium, and manganese	5 samples: Dissolved oxygen, pH 1 sample: Total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	1 *E. coli* bacteria 1 Fluoride 1 Total dissolved solids 4 Suspended sediment concentration 4 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Insufficient sampling events.	Lab detection limits for selenium were higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – Collect missing core parameters to represent at least 3 seasons. Use lower lab detection limit for selenium.	

Verde Watershed

Watershed Description

This watershed is defined by the Verde River drainage that flows into the Salt River, including Big Chino Wash and its tributaries. This 6,624 square mile watershed has an approximate population of 153,000 people (2000 census), but is growing rapidly. Although this is only 3% of the state population, several communities are located in this watershed: Payson, Sedona, Cottonwood, Verde Valley, Prescott, and the southern outskirts of Flagstaff. Land ownership is 65% federal, 23% private, 10% state, and 2% tribal. Primary land uses are open range grazing, irrigated agriculture, recreation, forestry, and some mining.

Elevations range from more than 12,000 feet (above sea level) in the San Francisco Mountains to about 1,600 feet as the Verde River flows into the Salt River. The watershed is split between warmwater communities below 5,000 feet and coldwater communities above 5,000 feet where perennial waters exist.

Water Resources

The Verde Watershed receives slightly more precipitation than most watersheds in this state, with some areas receiving about 20 inches of rain and 3 inches of snow. Therefore, the Verde River and many of its tributaries are perennial waters.

An estimate of surface water resources in the Verde Watershed is provided in the following table. Waters on Tribal lands are not assessed by ADEQ; therefore, those statistics are shown separately.

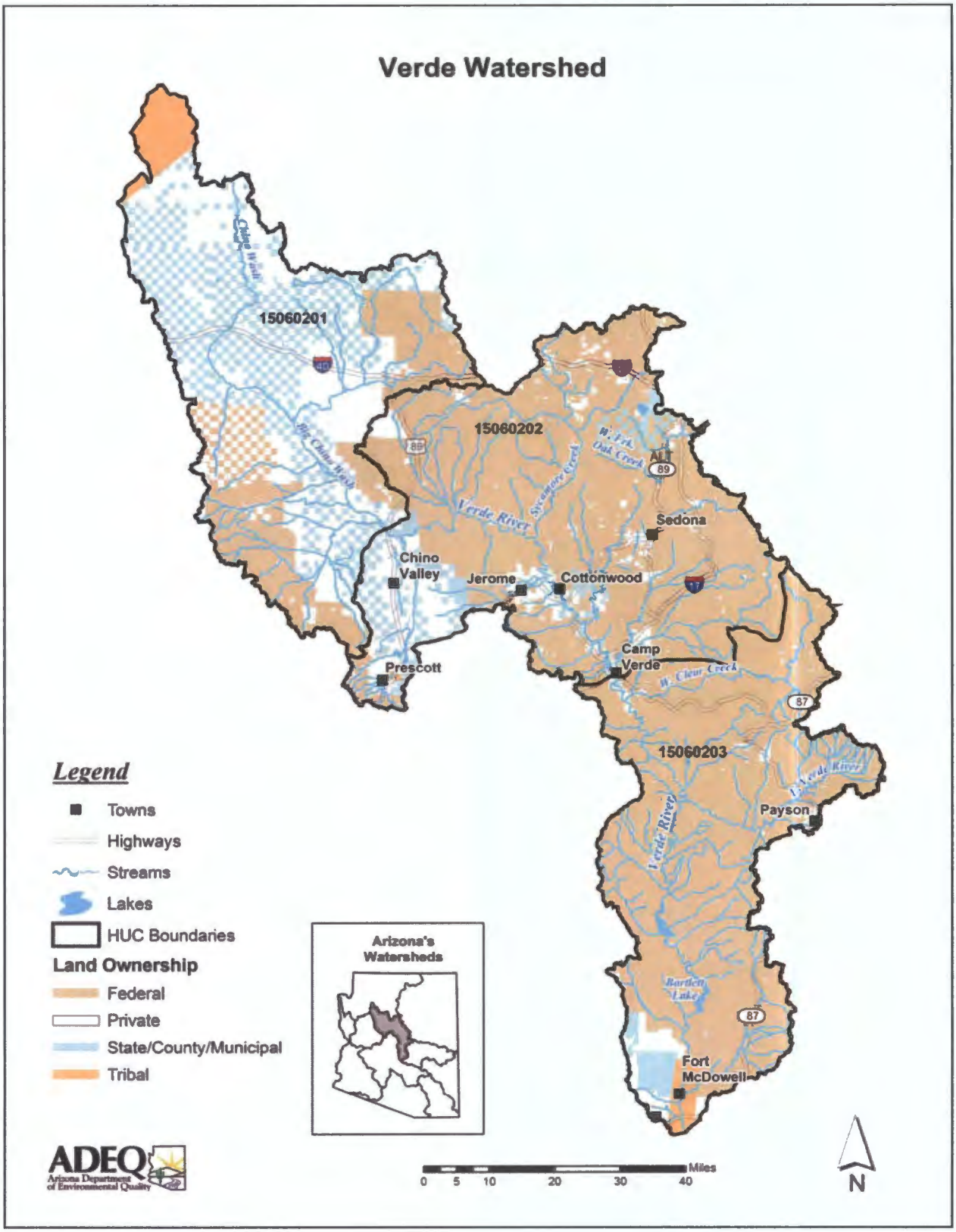
Estimated Surface Water Resources in the Verde Watershed

	Perennial	Intermittent	Ephemeral
Stream miles	450	2,115	5,990
	Perennial	Non-perennial	
Lake acres	4,603	3,636	

On Tribal Land – Not Assessed

	Perennial	Intermittent	Ephemeral
Stream miles	15	5	230
	Perennial	Non-perennial	
Lake acres	6	0	

Ambient monitoring focuses on perennial waters; however, special investigations may identify water quality problems on intermittent and even ephemeral waters. Estimated miles and acres are based on USGS digitized hydrology at 1:100,000 and have been rounded to the nearest 5 miles or 5 acres.


Verde Watershed
15060201
15060202
15060203
Chino Valley
Prescott
Jerome
Cottonwood
Sedona
Camp Verde
Payson
Fort McDowell
Verde River
Big Chino Wash
W. Fk. Oak Creek
Sycamore Creek
W. Clear Creek
E. Verde River
Barbers Lake
Legend
Towns
Highways
Streams
Lakes
HUC Boundaries
Land Ownership
Federal
Private
State/County/Municipal
Tribal
Arizona's Watersheds
ADEQ
Arizona Department of Environmental Quality
0 5 10 20 30 40
Miles
N

Watershed Partnerships

The following watershed groups are active in this watershed:

- Citizens Water Advocacy Group
  The area of concern includes the upper Verde River and Prescott Active Management Area. Its primary objective is to promote sustainable water resources into the future. The group meets on the 2nd Saturday of each month in Prescott. For information, contact (928) 443-5353 or water@commspeed.net.

- Hyde Mountain Vista Group
  The Walnut Creek stream reaches between Apache Creek and Juniper Mesa Wilderness. Goal is to maintain the diversity, ecological integrity, historic value, and undeveloped nature of the public and private lands in and around the Santa Maria and Juniper Mountains, while maintaining economic viability. Focus is on restoration of the upper Walnut Creek drainages, tributaries to Big Chino Wash and Verde River. Group meets as needed. Contact Susan Brook, Administrative Assistant, (928) 541-7538, hydemountainvista@yahoo.com.

- North Central Arizona Regional Watershed Consortium (NCARWC)
  The area of concern is the Verde Watershed within Yavapai County. The group was formed to accomplish cooperative regional water management and water rights. NCARWC believes that a unified and knowledgeable voter base in rural Arizona may be able to effect needed changes in Arizona's water laws and statutes. Contact Anita Rochelle (President) at anitar772002@yahoo.com or riverwoman@verdenet.com; or Bill Goss at bill@billgoss.net.

- Oak Creek Canyon Task Force
  The Task Force was created to conserve and enhance natural resources and recreational opportunities, sustain and improve recreational opportunities, improve water quantity and quality, reduce damage due to storms, floods, human activities, or natural disasters, and engage public and government involvement through outreach and education. Meetings occur on the 2nd Thursday of the month in Sedona. Contact Barry Allen (623) 551-8804, nelsenallan@earthlink.net, or Morgan Stine at morgan@hughes.net.

- Prescott Creeks Preservation Association (Prescott Creeks)
  The mission of Prescott Creeks is to protect and celebrate the ecological integrity of Granite Creek Watershed riparian systems and associated wetlands through conservation, restoration, and education. This is accomplished through programs that include: Watson Woods Riparian Preserve, Prescott Creek Watch Network and watershed monitoring. Meetings dates and times vary. Contact (928) 445-5699, info@prescottcreeks.org, mbyrd@prescottcreeks.org, or www.prescottcreeks.org.

- Stewards of Public Lands
  Area of concern is the upper portion of the middle Verde (HUC 15060202). Area citizen volunteers are partnering with businesses, municipalities, State Lands Department, and the US Forest Service to clean up illegal dumping areas on public lands and to improve watershed and stream health. They meet on the first Monday of the month in Cottonwood, AZ. Contact Diane Jones, (928) 634-4112, dianej@sedona.net, or www.verdeconnections.com.

- Stoneman Lake Property Owners Association
  Stoneman Lake is a 900 acre lake drainage area 40 miles south of Flagstaff Arizona. The association's missing is to preserve the pristine environment and foster harmony and cooperation among neighbors. Contact Chris Estes, President at (480) 585-5772, cklestes@msn.com, or Bill McPeters, Vice President, (602) 431-1513, wedigit@juno.com.

- Verde River Citizens Alliance
  This corporation was formed for philanthropic, educational, and scientific purposes. Its main objectives are to assure an adequate flow of water throughout the Verde and preserve and restore riparian habitat along

the Verde River and its tributaries. It meets on Saturdays in Cottonwood, AZ. Contact Bill Goss, President, at (928) 649-2422, vrca@verdenet.com, billgoss@cableone.net, or www.verdevirervrca.org.

- Verde Watershed Association
  This group works to conserve, sustain, and improve the diversity of natural resources and recreational opportunities, while reducing impacts from human activities, across the Verde Watershed. It uses outreach and education to engage public and government involvement in water related issues. The Verde Watershed Association meets on the 3rd Wednesday of the month. Contact Loyd Barnett, President, (928) 284-0161, lbarnettaz@npgcable.com or verdewatershed@yahoo.com, or http://vwa.southwest-water.org.

- Yavapai County Water Advisory Committee
  This committee is committed to preserving sustainable water resources for future generations while enhancing the economic viability of Yavapai County. The objective is develop and enact a water management and conservation strategy to ensure sustained use of water resources, while protecting base flows in rivers and streams. The committee meets on the 3rd Wednesday of the month. Contact John Rasmussen at john.rasmussen@co.yavapai.az.us, (928) 442-5199, or http://www.co.yavapai.az.us/orggroups/wac/wachome.asp.

Special Studies and Water Quality Improvement Projects

Total Maximum Daily Load Analyses – The following TMDL analyses have been completed, are ongoing, or are scheduled to be completed in this watershed. Further information about the status of these investigations or a copy of the TMDL, if completed, can be obtained at ADEQ's website: www.azdeq.gov.

- **East Verde River is impaired by arsenic, boron, and selenium.**
  Arsenic and boron present public health risks to people using the water as a domestic drinking source. There is evidence that the exceedances are more likely to occur during low flow periods when groundwater is the main contributing factor, but further investigation is needed to fully determine source loadings. The TMDL for arsenic and boron is scheduled to be completed in 2011. Selenium concentrations represent a risk to aquatic life and animals that prey on them, but does not pose a risk to human health at levels found. Further monitoring and investigation is needed to determine source loadings and contribution from natural sources. The TMDL investigation is scheduled to be initiated in 2009.

- **Granite Basin Lake was investigated due to low dissolved oxygen and potentially excess nutrients.**
  A TMDL study in 2004 found that the low dissolved oxygen levels were naturally occurring, and therefore, the lake was delisted.

- **Oak Creek is impaired by *Escherichia coli* bacteria.**
  Exceedances of *Escherichia coli* bacteria standard may represent a significant public health concern if people are swimming or even wading in the water. To protect the public, Slide Rock State Park closes their swimming area when bacteria standards are exceeded.

  A TDML for *E. coli* on Oak Creek was approved in 1999. To meet standards, the following strategies were to be implemented:
  - Reduce sediment loading to Oak Creek, as bacteria were associated with the sediment;
  - Identify failing septic systems and repair or replace these systems;
  - Reduce recreation impacts on water quality (e.g., improved public restroom and shower facilities, improved trash management); and
  - Reduce animal waste impacts on water quality (e.g., control drainage from pastures and trails, control litter and other wastes that attract skunks and raccoons).

  Many of these strategies have been implemented through the efforts of the Oak Creek Task Force using Water Quality Improvement Grants and other funding sources (see projects below). For example, "Keep Oak Creek Canyon Beautiful" campaign arranges for volunteers to hand out litter bags and discuss waste

disposal with summer holiday visitors who flock to Oak Creek during the big summer holidays. Hikers and picnickers are encouraged to haul out trash when they leave the creek area.

ADEQ initiated a Phase II TMDL in 2004 to measuring the effectiveness of the implemented management measures to reduce bacterial loading in Oak Creek, and further delineate the extent of the contamination, further study sources and loadings within the watershed. The TMDL study is also look at how lowering the *E. coli* standard in 2002 will impact achieving bacterial standards in Oak Creek.

- **A phosphorus and nitrogen (nutrient) TMDLs were completed on Oak Creek and Munds Creek in 1999.**
  The loading analyses indicated that Oak Creek's status as a Unique Water and the existing discharge limits to Oak Creek are sufficient protection. Using modeling, few nutrient standard violations would be predicted. No new nutrient limits were needed for septic system loadings on Oak Creek. Improvements to wastewater treatment systems on Munds Canyon had also been effective in eliminating nutrient exceedances.

- **Pecks Lake impairment by high pH and low dissolved oxygen (narrative nutrients).**
  A narrative nutrient TMDL was completed in 2000 for this 95 acre lake. Low dissolved oxygen and high pH were primarily caused by aquatic weed growth (macrophytes), which at times cover 90% of the lake surface. The TMDL concluded that a 25% reduction in nitrogen and phosphorus is needed through weed harvesting and reducing sediment transport into the lake.

- **Stoneman Lake is impaired by low dissolved oxygen and high pH (narrative nutrients).**
  The TMDL was completed in 2001 for this 120-acre natural lake. The nutrient TMDL was calculated for average hydrologic conditions, with critical conditions being summer, with high temperatures and peak macrophyte growth. Both dissolved oxygen and pH standards should be met with a 35% reduction in biomass density and biological oxygen demand. Due to an extensive state-wide drought, the lake went dry soon after the TMDL. Monitoring will be initiated when the lake refills and stabilizes. Some management actions were implemented to reduce potential loadings from septic systems and suspended sediment flowing into the lake during runoff events.

- **The Verde River impairment by suspended sediments/turbidity.**
  A turbidity TMDL was completed in 1999. Turbidity impairment appears to be directly correlated to large storm events, and no load reduction is necessary during average or base flow conditions (when exceedances do not occur). A variety of management actions were identified in the implementation plan to reduce sediment loading to the Verde River, including:
  - Improve livestock management practices
  - Designate off-highway vehicle areas and employ best management practices at these sites to reduce sediment transport;
  - Implement the "Red Rock Passport," a comprehensive recreation plan for the Sedona area where recreational opportunities would be limited on some heavily used areas to reduce soil compaction and erosion;
  - Establish grassland restoration projects to increase infiltration and reduce soil erosion by reducing pinyon and juniper densities and increasing vegetative ground cover.
  - Sponsor educational opportunities and public involvement in decisions regarding long-term management of the watershed;
  - Acquire land adjacent to the Verde River through land exchanges to reduce development in the active flood plain;
  - Use fire treatments to reduce adverse watershed effects from uncontrolled wildfire; and
  - Maintain and modify water catchment structures to reduce the amounts of fine sediments traveling through the system.

- **Watson Lake is impaired due to nitrogen, low dissolved oxygen, and pH.**
  Watson Lake has excess nutrient loading (nitrogen) which is also causing low dissolved oxygen and high pH. Further monitoring and investigation is needed to determine source loadings and contribution from natural sources. The TMDL investigation is scheduled to be initiated in 2010.

- **Whitehorse Lake is impaired due to low dissolved oxygen.**
  Low concentrations of dissolved oxygen may represent a risk to aquatic life and may indicate excess nutrient loading to the lake. A TMDL was initiated in 2006 to determine the cause of the low dissolved oxygen.

Water Quality Improvement Grant Projects – ADEQ awarded the following Water Quality Improvement Grants (319 Grants) in this watershed. More information concerning these grants or projects can be obtained at: http://www.azdeq.gov/environ/water/watershed/fin.html.

- **Verde River Headwaters Riparian Restoration Demonstration Project**
  Blue Ridge and Long Valley Ranger Districts (2000)
  Revegetate the riparian area along West Clear Creek to stabilize banks and decrease channel cutting, thereby reducing sediment.

- **Cornville Watershed Project**
  Yavapai County Flood Control (2000)
  Revegetate the riparian area with native vegetation, provide rip rap and other structures, and reconstruct the Greenwell Slough to catch sediment and slow storm water flow. Greenwell Slough is adjacent to Oak Creek.

- **Water Quality Guardian Program**
  Oak Creek Task Force (2001)
  Install public restrooms, public showers, and sediment reduction facilities to reduce impacts of human activities on Oak Creek and reduce bacteria loading to the stream.

- **Sedona Gun Range Lead Removal and Site Restoration Project**
  Coconino National Forest (2002)
  Remove lead and aromatic hydrocarbon contamination from the Sedona Gun Range which is located along Mormon Wash, which flows into Oak Creek.

- **Fecal Coliform and Sediment Reduction for Oak Creek Project**
  Coconino National Forest (2002)
  Stabilize and restore 10 acres of bare ground at five sites to reduce erosion and improve long-term soil productivity. Install three restrooms at popular trailhead sites to eliminate potential for fecal coliform contamination. Public outreach will include interpretive signs near the toilet facilities.

- **Upper Verde Collaborative Watershed Restoration Project**
  EcoResults! Inc. (2002)
  Create new pastures for grazing, remove juniper trees, and reclaim gullied roadways and eroding rangelands through hay trampling. Public outreach provided through education workshops to educate ranchers, agency personnel, and other individuals in the Prescott and Chino Valley area.

- **West Clear Creek Project**
  M Diamond Ranch (2003)
  Reduce runoff on rangeland adjacent to West Clear Creek by installing fences, a corral, and an alternative water system as part of a rotational grazing management plan.

- **Keep Oak Creek Beautiful Campaign**
  Oak Creek Task Force (2004)
  Provide toilets and wastewater treatment system at Indian Gardens Visitor Center. Provide sediment control structures throughout Oak Creek Canyon. Develop a Task Force webpage. Expand the "Keep Oak Creek Canyon Beautiful" campaign for waste removal by people enjoying the canyon during holidays.

- **Ash Creek Watershed Project**
  Henry Dahlberg Foundation (2004)
  Remove sedimentation caused by road and steep side drainages along Ash Creek. Mitigate erosive effects of planned forest thinning and prescribed burns.

- **Upper Verde River Wildlife Area Turbidity Reduction Project**
  Arizona Game and Fish Department (2004)
  Exclude livestock from riparian areas using fencing, remove old roads and add barriers to control off-highway vehicle travel, adjust stream bank slope, and revegetate using native plants along flood plain terraces, close stream banks and other vulnerable areas to off-highway vehicles.

- **West Clear Creek Tributary Watershed Project**
  M Diamond Management LLC (2004)
  Collaborative project to reduce sediment loading and restore watershed function by improving ephemeral stream channels in tributaries to West Clear Creek.

- **Granite Creek Watershed Water Quality Improvement and Monitoring Project**
  Prescott Creeks Preservation Association (2006)
  Implement four management strategies to improve water quality:
  - Redesign and construct a faulty stormwater runoff basin,
  - Apply stenciling to storm drains to inform the public about the consequences of dumping waste down the storm drains,
  - Develop management strategies for ranchers and other owners of riparian areas and
  - Monitor for metals and bacteria to assess water quality improvement.

- **Hart Prairie Sediment Control Project**
  The Nature Conservancy (2006)
  Install French drains, water bars and elevated roadways within the Hart Prairie Preserve near Flagstaff to improve and protect rare Bebb willow wetlands.

Water Protection Fund Projects – The following Water Protection Fund Projects were awarded by the Arizona Department of Water Resources. More information about these funds or projects can be obtained from the ADWR web site at: http//www.azwater.gov.

- **Verde River Riparian Restoration Partnership Project**
  Mingus High School (2003)

- **Verde Headwaters 3-D Hydrogeological Model Project**
  Northern Arizona University (2004)
  Create and present a hydrogeological visualization of the Verde River headwaters area to help educate the public concerning ground water resources.

- **Watson Woods Riparian Preserve Restoration Feasibility Project**
  Prescott Creeks Preservation Association (2004)
  Conduct a feasibility study to rehabilitate 1-mile segment of Granite Creek in the Watson Woods Riparian Preserve.

- **Verde Wild and Scenic River Fence Exclosure Project**
  Prescott National Forest (2005)
  Add fencing to exclude livestock in the Brown Springs allotment to implement the Verde Wild and Scenic River Comprehensive River Management Plan.

Other Water Quality Studies – The following additional water quality related studies were completed since 2000 in this watershed.

- ***Preliminary Ecological Assessment of Four Mogollon Rim Watersheds***
  Grand Canyon Wildlands Council, Inc.
  Conduct a preliminary ecological assessment of the invertebrates, vegetation, small mammals, and herptofauna on East Clear Creek, West Clear Creek, Wet Beaver Creek, and Chevelon Creek. This assessment is to provide management recommendations for non-native species control, habitat protection, resource potential, and abundance, distribution, and type of species observed. The data collection occurred in 2005 and reports are to be produced in 2006.

- ***Oak Creek Canyon Escherichia coli Genotyping Project***
  Paul Keim and Christine Keys, Northern Arizona University (2000)
  Escherichia coli bacteria were isolated from water and sediment samples collected at different sites along Oak Creek. These bacteria samples were then genotyped to differentiate the source of this fecal pollution (human, horse, deer). This study made the following conclusions:
  - Fecal contamination was higher during the summer months;
  - Fecal pollution came from multiple sources: elk, cow, human, dog, deer, raccoon, horse, skunk, llama, beaver, bear, and mountain lion;
  - Fecal pollution in Oak Creek is not a re-growth phenomenon;
  - Most of the fecal pollution comes from natural populations in the canyon (e.g., elk, deer), with seasonal impacts from human activities (human, horse, dog);
  - Genotypes in the water and in the sediment do not match at a site; therefore, they include bacteria being transported down the river; and
  - *E. coli* populations do over winter in sediment at a site, but are not a major contribution to the *E. coli* population found at that site during the summer.

- ***Verde River Assimilative Capacity – Data Summary Report***
  Tetra Tech, Inc. submission to ADEQ (2000)
  Significant population growth is projected for some portions of the watershed. This growth will increase nutrient loads from runoff in residential areas and contributions of on-site wastewater disposal via ground water. In addition, several cities and towns within the watershed have proposed new wastewater discharges to the Verde River of its tributaries. This is a study of the river's ability to accept additional nutrient loading and maintain water quality standards. The area of focus was from Perkinsville to Childs, a 90 mile stretch of the Verde River.

- ***Sources of Springs Supplying Base Flow to the Verde River Headwaters, Yavapai County, Arizona***
  Laurie Wirt and H.W. Hjalmarson, U.S. Geological Survey (2000)
  Multiple lines of evidence were used to identify source aquifers, quantify their contributions, and trace the ground water flow paths that supply base flow to the uppermost reach of the Verde River. The research showed that the interconnected aquifers in Big Chino Valley are the primary source of Big Chino Springs, presently supplying at least 80% of the upper Verde River's base flow.

- ***Verde Watershed Restoration Action Strategy***
  Verde Watershed Association (2000)
  This plan provides a description of the existing conditions and issues in the Verde Watershed and proposes ongoing and future projects and implementation actions. It will be updated periodically as projects are implemented and evaluated, making it a continuous, forward-looking plan. Potential implementation actions are identified and prioritized based on available resources and people or agencies willing to implement them.

- ***Lower Verde / Lower Salt River Management Plan and Restoration Strategy***
  Lower Verde / Lower Salt River Watershed Advisory Group (2000)
  This plan identifies the areas of greatest concern for water resources, initiates pollution source identification, and identifies programs and potential actions to remediate these sources

- ***Occurrence and Quality of Surface Water and Ground Water within the Yavapai Prescott Indian Reservation, Central Arizona, 1994-98.***

G.R. Littin, Margot Truini, H.A. Pierce, and B.M. Baum, US Geological Survey (2000)
The Yavapai-Prescott Indian Reservation includes about 2 square miles near the City of Prescott. This is a study of the water resources provided by Granite Creek, which bisects this reservation, springs, and other ground water.

- ***Oak Creek Canyon Watershed Based Plan***
  Oak Creek Canyon Task Force (2002)
  This plan characterizes this sub-watershed, identifies pollutant sources and strategies to reduce these pollutants and agencies or individuals who should be involved in these actions. This plan focuses on nutrient and bacterial contamination issues.

- ***Contaminants in Fish and Birds of Watson Lake, Arizona 2000-2001***
  Carrie L.H. Marr and H. Maaike Schotborgh, U.S. Fish and Wildlife Service (2003)
  A wood treatment facility located on Yavapai-Prescott Indian Tribe land, near Prescott, released pentachlorophenol (PCP), arsenic, and chromium into the environment from 1961-1985. Sediment, water, fish crayfish, eggs, tadpoles, and frogs were sampled for trace elements, organochlorine insecticides, polyaromatic hydrocarbons, total polychlorinated biphenyls, dioxins, and furans. The report concluded that the former Southwest Forest Industries had minimal effect on Granite Creek and Watson Lake. Arsenic and chromium levels were elevated in fish; however the consequences of this elevation in fish tissue are unknown. Fish tissue PCP concentrations were lower than expected, probably due to removal and clean up of the PCP treatment pond from the site. Elevated levels of mercury in the fish tissue from Granite Creek and Watson Lake warrant further monitoring and evaluation to determine sources of the mercury and potential for reductions.

- ***Water Quality Data for Selected National Park Units, Southern and Central Arizona and West-Central New Mexico, Water Years 2003 and 2004***
  U.S. Geological Survey in cooperation with the National Park Service (2005)
  Field measurements and water samples were collected at springs, mine adits, streams, and wells at 30 sites in 9 park units in 2003-2004 to provide baseline (ambient) water quality information. Only 24 of the 30 sites were sampled three times due to drought conditions and lack of water during parts of the year.

- ***Assessment of Selected Inorganic Constituents in Streams in the Central Arizona Basins Study Area, Arizona and Northern Mexico, through 1998***
  David Anning – U.S. Geological Survey, National Water Quality Assessment Program (2003)
  Inorganic chemical data (dissolved solids, suspended sediment, and nutrients) and stream properties (temperature, pH, dissolved oxygen) were analyzed to assess water quality, determine natural and human factors affecting water quality, and compute stream loads.

- **Reservoir Studies**
  David Walker, University of Arizona
  This is an ongoing and comprehensive study of water quality in reservoirs serving the Phoenix metropolitan area. The goal is to use monitoring data to answer water quality management questions in a proactive manner. A yearly report is produced. In 2005, the report provided information about:
  - Climate and drought effects on water quality,
  - Wildfire effects on water quality,
  - Harmful algal blooms,
  - Atmospheric deposition and the use of sediment to look at accumulation of pollutants, and
  - Endocrine disruption compounds.

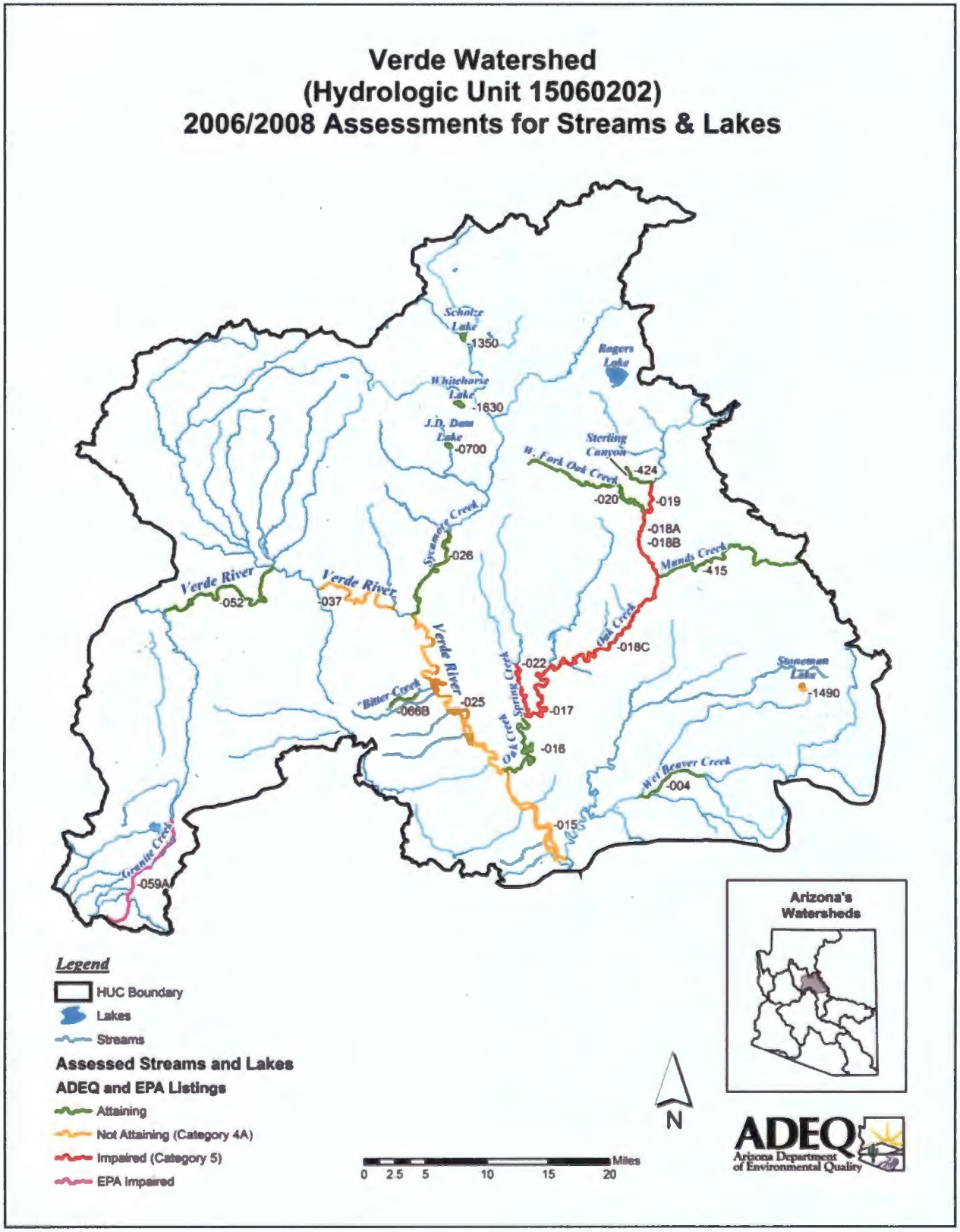
Assessments

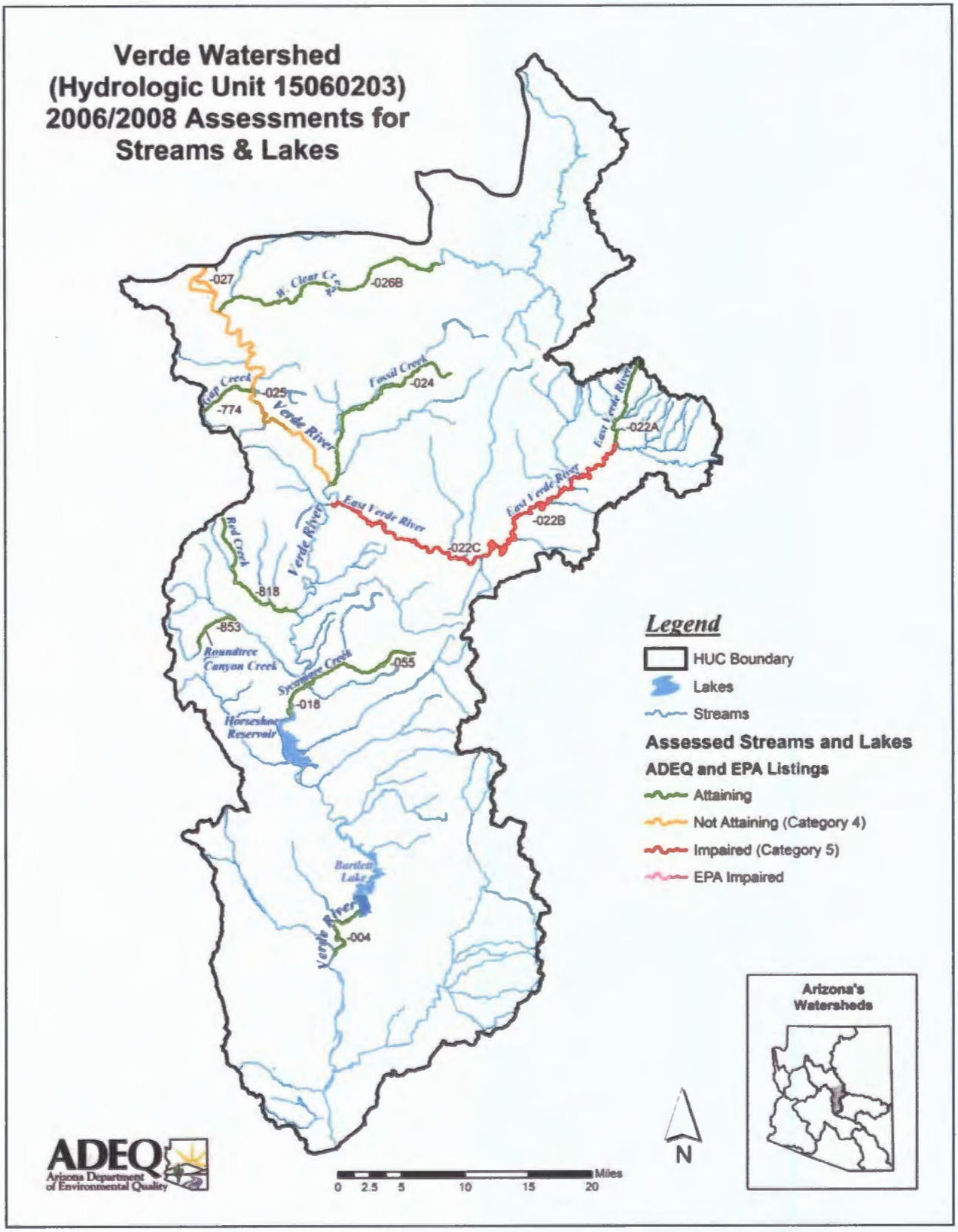
The Verde Watershed can be separated into the following drainage areas (subwatersheds):

15060201 Big Chino Wash Drainage Area
15060202 Upper Verde River Drainage Area

15060203 Lower Verde River Drainage Area

These drainage areas and the surface waters assessed as "attaining" or "impaired" are illustrated on the following watershed map. Methods used to complete these assessments are described in the "Surface Water Assessment Methods and Technical Support" document (2006).


Verde Watershed
(Hydrologic Unit 15060202)
2006/2008 Assessments for Streams & Lakes
Schnze Lake
-1350
Rogers Lake
Whitehorse Lake
-1630
J.D. Dam Lake
-0700
Sterling Canyon
W. Fork Oak Creek
-424
-020
-019
-018A
-018B
Munds Creek
-415
Sycamore Creek
-026
Verde River
-052
Verde River
-037
Verde River
Oak Creek
-018C
-022
Spruce Creek
Stoneman Lake
-1490
Bitter Creek
-066B
-025
-017
Oak Creek
-016
Wet Beaver Creek
-004
-015
Granite Creek
-059A
Legend
HUC Boundary
Lakes
Streams
Assessed Streams and Lakes
ADEQ and EPA Listings
Attaining
Not Attaining (Category 4A)
Impaired (Category 5)
EPA Impaired
0 2.5 5 10 15 20
Miles
N
Arizona's Watersheds
ADEQ
Arizona Department of Environmental Quality


Verde Watershed
(Hydrologic Unit 15060203)
2006/2008 Assessments for
Streams & Lakes
-027
W. Clear Creek
-026B
Fossil Creek
-024
Rapp Creek
-025
-774
Verde River
East Verde River
-022A
East Verde River
-022B
East Verde River
-022C
Red Creek
-818
Verde River
-853
Roundtree Canyon Creek
Sycamore Creek
-055
-018
Horseshoe Reservoir
Bartlett Lake
Verde River
-004
Legend
HUC Boundary
Lakes
Streams
Assessed Streams and Lakes
ADEQ and EPA Listings
Attaining
Not Attaining (Category 4)
Impaired (Category 5)
EPA Impaired
Arizona's Watersheds
N
ADEQ
Arizona Department of Environmental Quality
0 2.5 5 10 15 20
Miles

ASHBROOK WASH (Previously identified as Grande Wash) From Grande Wash to Verde River 15060203 – 989 2 Miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&We – Inconclusive PBC – Inconclusive	Category 3 Inconclusive		Delist *E. coli.* Wastewater discharge no longer occurring.

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 03/06/2000 NUMBER AND TYPES OF SAMPLES Metals	Nutrients – Related	Other
At Fountain Hills, AZ VRGRW001.64 101596	USGS Special investigation	1 dissolved sample: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, zinc.	1 Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	1 *E. coli* bacteria 1 Total dissolved solids 1 Pesticides 1 VOCs (solvents) 1 Petroleum products

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	576 CFU/100 ml PBC	03/06/2000 – 1000 CFU/100 ml	Inconclusive – 1 exceedance during the last 3 years of monitoring. Occurred during an illegal discharge of wastewater into what would be a dry wash. This discharge has not been occurring for more than 3 years.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Insufficient sampling events	
MONITORING RECOMMENDATIONS		Low Priority – Collect core parameters to represent at least three seasons during the assessment period.	

BARTLETT LAKE 15060203 – 0110 2375 Acres	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining DWS – Attaining AgI – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLE PERIOD: 03/02/2000 – 07/12/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Dam VRBAR-A 100009	ADEQ and U of A Ambient	17-19 total metals and 5 -11 dissolved metals: Antimony, boron, cadmium, chromium, copper, lead, manganese, nickel, selenium, silver, and zinc. 7-19 total metals only: Mercury, thallium	31-40 Dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen	12 *E. coli* bacteria 6 Benzene, ethylbenzene; toluene, xylene 28 Fluoride; 15 Total dissolved solids; 31 Temperature; 27 Turbidity
At Bartlett Flats VRBAR-FLAT 102536	ADEQ Special Study			
At Marina – site 1 VRBAR-MAR1 100986	ADEQ Ambient			
Mid lake VRBAR-B 10010	ADEQ and U of A Ambient			
Riverine Zone VRBAR-C 10011	ADEQ and U of A Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
None	All core parameters collected.		
MONITORING RECOMMENDATIONS		Low Priority – Note that the old turbidity standard (25 NTU) was exceeded in only 1 of 11 samples (129 NTU). Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted	

BEAVER CREEK From Dry Beaver Creek to Verde River 15060202 – 002 9.3 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 11/26/2002 – 10/07/2003 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Near Montezuma Castle National Park VRBEV005.74 101542	USGS Ambient	1 total and 3-4 dissolved samples: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, nickel, and zinc 3 dissolved metals: Barium, silver, uranium 1 total and dissolved: mercury	3-4 samples: Dissolved oxygen, pH, phosphorus 1 sample: Ammonia, nitrite/nitrate, nitrogen, TKN	1 *E. coli* bacteria 1 Fluoride 1 Total dissolved solids; 1 Turbidity 1 Suspended sediment concentration
Above Verde River VRBEV000.72 100722	ADEQ Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
None	Insufficient total nitrogen and phosphorus, mercury, *E. coli*, copper, and lead to assess A&W, FBC, and AgL.		Lab detection limits for selenium and dissolved mercury were higher than A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – Collect missing core parameters to represent at least 3 seasons during the assessment period. Use lower lab detection limits for selenium and dissolved mercury. Beaver Creek had been impaired due to turbidity until the turbidity standard was replaced by the suspended sediment concentration (SSC) criteria. Suspended sediment samples should be collected in Beaver Creek. Also, recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

BITTER CREEK From Jerome WWTP to Yavapai Apache Indian Reservation 15060202 – 066B 1.6 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wedw – Inconclusive PBC – Attaining AgL – Attaining	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 11/12/2003 – 06/21/2004		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
0.5 miles below Jerome WWTP VRBIT003.93 100424	ADEQ Ambient	3-4 dissolved and total metal samples: Antimony, arsenic, beryllium, cadmium, chromium, copper, lead, manganese, zinc 4 total metals samples only: Boron, manganese 4 total and 2 dissolved: Lead, mercury 1 total: Selenium	4 samples: Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	4 *E. coli* bacteria 4 Suspended sediment concentration 4 Turbidity 4 Total dissolved solids

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Selenium	2 µg/L A&Wedw chronic	05/04/2004 – 11 µg/L	Inconclusive – Only 1 exceedance during the assessment period. Lab detection limit on other selenium samples was too high to determine attainment.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Selenium	Collected all core parameters		Lab detection limits for selenium and dissolved mercury were higher than A&W chronic criteria
MONITORING RECOMMENDATIONS		Medium Priority – Collect additional selenium data due to the exceedance. Use lower laboratory detection limits for selenium and dissolved mercury.	

COLONY WASH From headwaters to Verde River 15060203 – 998 4.9 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&We – Inconclusive PBC – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/24/2000 and 02/03/2003		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Fort McDowell boundary VRCLW002.11 101519	USGS Special Study	1-2 dissolved metal samples: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, mercury, manganese, nickel, and zinc, selenium, silver, zinc	1-2 samples: Dissolved oxygen, pH, phosphorus 1 sample: Ammonia, nitrite/nitrate, nitrogen, TKN	1 *E. coli* bacteria 2 Fluoride 2 Total dissolved solids; 1 Turbidity 1-2 Pesticides 1-2 VOCs

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Insufficient sampling events.	Lab detection limits for selenium and dissolved mercury were higher than A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – Collect missing core parameters to represent at least three seasons during an assessment period. Use lower lab detection limits for selenium and dissolved mercury.	

DRY CREEK From headwaters to Oak Creek 15060202 – 021 22.7 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/11/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Yavapai County stage logger VRDRY007.02 100656	ADEQ TMDL	1 dissolved metal sample: Antimony, arsenic, boron, cadmium, chromium, copper, lead, manganese, mercury, zinc.	1 Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	1 *E. coli* bacteria 1 Suspended sediment concentration 1 Turbidity

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Insufficient monitoring events	
MONITORING RECOMMENDATIONS		Low Priority – Collect core parameters to represent at least 3 seasons during the assessment period.	

EAST VERDE RIVER From headwaters to Ellison Creek 15060203 – 022A 8.1 miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Inconclusive FBC – Attaining FC – Inconclusive DWS – Inconclusive AgI – Attaining AgL – Inconclusive	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 11/24/2003 – 05/03/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above 2nd Crossing VREVR045.50 100786	ADEQ Fixed site	3 dissolved and total: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, manganese, zinc 3 total only: Chromium 2 total and 3 dissolved: Copper, mercury, lead	3 Ammonia, dissolved oxygen, pH, nitrite/nitrate, 2 Total nitrogen, total phosphorus, and total Kjeldahl nitrogen	3 *E. coli* bacteria 3 fluoride 3 suspended sediment concentration, 3 turbidity, 3 total dissolved solids

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	7.0 mg/L A&Wc	05/03/2004 – 6.4 mg/L	Inconclusive – 1 of 3 dissolved oxygen samples did not meet standards at 6.4 mg/L. (Binomial) (This is only slightly below the standard and is likely due to natural conditions and groundwater upwelling.)

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Dissolved oxygen	Insufficient copper, lead, mercury, nitrogen, and phosphorus are needed to assess AgL, FC, A&W, and DWS		Lab detection limit for selenium higher than the A&W chronic criterion.
MONITORING RECOMMENDATIONS		Medium Priority – Collect dissolved oxygen due low dissolved oxygen concentration in one sample. Collect missing core parameters to represent at least 3 seasons during an assessment period. Use lower lab detection limit for selenium samples.	

EAST VERDE RIVER From Ellison Creek to American Gulch 15060203 – 022B 20.3	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Impaired FBC – Attaining FC – Attaining DWS – Attaining AgI – Attaining AgL – Attaining	Category 5 Impaired	Selenium	Selenium listed in 2004

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/01/2000 – 05/31/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Hwy 87 Bridge near Payson VREVR034.80 100474	ADEQ Fixed site	6-23 dissolved and total: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, nickel, silver, thallium, and zinc. 1 Selenium	21-22 Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	18 *E. coli* bacteria 22 Fluoride 12 Suspended sediment concentration, 17 Turbidity, 21 Total dissolved solids

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Selenium	2.0 µg/L A&Ww chronic	01/18/2001 – 5.3 µg/L	Remains impaired – 1 exceedance during the assessment period. Lab detection limit for other samples were higher than chronic criteria so could not be used to determine attainment.
Mercury	0.6 µg/L FC	4/17/2002 – 1.2 µg/L	Attaining – Only 1 exceedance in 11 sampling events. (Binomial)

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Selenium	All core parameters collected		Lab detection limits for selenium and dissolved mercury were higher than A&W chronic criteria.
MONITORING RECOMMENDATIONS		High Priority – Data needed to support selenium TMDL development. Use lower lab detection limits for selenium and dissolved mercury samples. Note that the old turbidity standard (50 NTU) was exceeded in 2 of 21 samples (56 and 97 NTU). Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

EAST VERDE RIVER From American Gulch to Verde River 15060203 – 022C 25.8 miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Attaining FBC – Impaired FC – Attaining DWS – Impaired AgI – Impaired AgL – Impaired	Category 5 Impaired	Arsenic and boron	Adding arsenic and boron to the 303(d) List

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/26/2000 – 06/09/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Near Childs 15060203-022C VREVR002.62 100739	USGS Fixed site	18-19 samples of dissolved and total metals: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, nickel, selenium, silver, thallium, zinc. 19 total metals only: Mercury	18-19 samples: Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	18 *E. coli* bacteria 19 Fluoride 19 Suspended sediment concentration, 18 Turbidity, 19 Total dissolved solids

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Arsenic	50 µg/L – DWS, FBC 200 µg/L – AgL	05/30/2000 – 100 µg/L 09/27/2000 – 120 µg/L 03/26/2002 – 51 µg/L 06/26/2002 – 394 µg/L 08/28/2002 – 326 µg/L 10/29/2002 – 127 µg/L 06/25/2003 – 226 µg/L 08/27/2003 – 200 µg/L 10/29/2003 – 202 µg/L 03/29/2004 – 58 µg/L 06/24/2004 – 390 µg/L 08/27/2004 – 168 µg/L	Impaired – Exceeded 50 µg/L criterion in 12 of 22 samples. Magnitude of exceedance should also be noted. High arsenic concentrations may be due to natural conditions. Note that exceedances occur when flow is less than 5 cfs.
Boron	630 µg/L – DWS* 1000 µg/L – AgI	05/30/2000 – 1000 µg/L 06/26/2002 – 1730 µg/L 08/28/2002 – 1630 µg/L 10/29/2002 – 756 µg/L 06/25/2003 – 1270 µg/L 08/27/2003 – 969 µg/L 10/29/2003 – 959 µg/L 06/24/2004 – 1890 µg/L 08/27/2004 – 642 µg/L	Impaired-- 9 of 22 samples exceeded the 630 µg/L criterion. Magnitude of exceedances should also be noted. High boron levels also occur when flow is less than 5 cfs. *Standard will be revised to 1,400 ug/L for boron.
Dissolved oxygen	6.0 mg/L A&Ww	05/30/2000 – 5.6 mg/L 08/27/2004 - 5.5 mg/L	Attaining – Low dissolved oxygen due to natural conditions with low flows and ground water upwelling.
E. coli bacteria	235 CFU/100 ml FBC	08/27/2003 – 270 CFU/100 ml	Inconclusive – Only 1 exceedance during the last 3 years of monitoring. The exceedance is below ADEQ's screening value of 300 CFU/100 ml. The screening value is used for impairment decisions rather than the standard because laboratories provide an estimate of bacteria density.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	**MISSING CORE PARAMETERS**	**MISSING SEASONAL DISTRIBUTION**	**DETECTION LIMITS NOT LOW ENOUGH**
Boron and *E. coli* bacteria	All core parameters collected.		Lab detection limit for dissolved mercury was higher than the A&Ww chronic criterion.
MONITORING RECOMMENDATIONS		High Priority – Collect boron and arsenic samples to support TMDL development. Collect *E. coli* bacteria samples due to the exceedance. Use lower lab detection limits for dissolved mercury.	

FOSSIL CREEK From headwaters to Verde River 15060203 – 024 19.9 miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 08/15/2003 – 08/11/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above sunfish barrier VRFOS015.22 102852	AGFD Ambient	4 - 9 dissolved and total samples: Antimony, arsenic, boron, cadmium, chromium, copper, lead, zinc 4-9 total and 0-1 dissolved: Beryllium, manganese, and mercury	8-10 samples: Ammonia, dissolved oxygen, pH, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen 5 samples: Phosphorus	4 *E. coli* bacteria 9 Fluoride 4 Suspended sediment concentration, 5 Turbidity, 9 Total dissolved solids
Below Irvine Power Plant VRFOS013.98 102766	AGFD Ambient			
Above Irvine Power Plant VRFOS010.73 102764	AGFD Ambient			
Above Salley Mae Wash VRFOS007.36 100785	ADEQ Ambient			
Below Salley Mae Wash VRFOS007.62 102765	AGFD Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters	.	Lab detection limit for selenium was higher than A&W chronic criterion
MONITORING RECOMMENDATIONS		Low Priority – Use a lower lab detection limit for selenium.	

GAP CREEK From Government Springs to Verde River 15060203 – 774B 5.4 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 10/01/2003 – 04/27/2004		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
One-half mile above Salt Mine Road VRGAP000.92 100557	ADEQ Fixed site	3-4 dissolved and total samples: Antimony, arsenic, beryllium, cadmium, copper, lead, mercury, manganese, zinc. 4 total metals only: Boron, chromium, manganese	4 Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	4 *E. coli* bacteria 4 Fluoride 4 Suspended sediment concentration, 4 Turbidity, 4 Total dissolved solids

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	All core parameters collected		Lab detection limit for selenium was higher than A&W chronic criterion.
MONITORING RECOMMENDATIONS		Low Priority – Use a lower lab detection limit for selenium samples .	

GRANITE BASIN LAKE 15060202 – 0580 7 Acres	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Attaining AgI – Inconclusive AgL – Inconclusive	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/28/2002 – 03/08/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Dam VRGLB-A 100024	ADEQ Ambient	3-5 samples of dissolved and total metals: Antimony, arsenic, barium beryllium, boron, cadmium, chromium, copper, lead, manganese, nickel, selenium, silver, zinc. 5 total mercury (no dissolved)	5 samples: Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	4 *E. coli* bacteria 5 Fluoride 5 Turbidity, 4 Total dissolved solids
At Boat Ramp VRGLB-BR 101398	ADEQ Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Ammonia	4.6 at pH 7.2 and water temperature 17.2 A&Ww chronic	08/28/2002 – 7.65 mg/L	Inconclusive – Only 1 exceedance during the last 3 years of monitoring. (1 of 5 sampling events.)
Arsenic	50 µg/L FBC	08/28/2002 – 60 µg/L	Inconclusive –1 of 6 samples exceeded the arsenic criterion of 50 µg/L. (Binomial)
Dissolved oxygen	6.0 mg/L A&Ww	08/28/2002 – 3.63 mg/L	Attaining – Low dissolved oxygen due to natural conditions during lake "turn over."
Manganese	10,000 µg/L AgI	08/28/2002 – 12,000 µg/L	Inconclusive – Only 1 of 6 samples exceeded criterion. (Binomial)
pH	<9.0 SU A&Ww, AgI, AgL, FBC	05/22/2002 – 9.3 SU	Inconclusive – Only 1 of 6 samples exceeded criterion (Binomial)

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Ammonia, arsenic, dissolved oxygen, manganese, pH	All core parameters collected.		Lab detection limit for dissolved mercury was higher than the A&Ww chronic criterion.
MONITORING RECOMMENDATIONS		Medium Priority – Collect arsenic, manganese, and pH samples due to exceedances. Low dissolved oxygen and elevated pH may be symptoms of excess nutrient loading. New methods for implementing the narrative nutrient standard should be applied to this lake once adopted, to determine whether narrative nutrient violations are occurring. Use a lower lab detection limit for dissolved mercury.	

GRANITE CREEK From headwaters to Willow Creek 15060202 – 059A 13.4 Miles		USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	ADEQ	A&Wc – Inconclusive FBC – Inconclusive FC – Inconclusive AgI – Inconclusive AgL – Inconclusive	Category 3 Inconclusive		
	EPA	A&Wc – Impaired)	Category 5 Impaired	Dissolved oxygen	EPA listed dissolved oxygen in 2004

Light blue highlights indicate EPA impairments based on EPA assessment and listing criteria. This listing may change when EPA reviews and approves the 2006/2008 impaired waters list. Such listings do not satisfy requirements established in ADEQ's Impaired Water Identification Rule; therefore, they are not included in the list of ADEQ's Impaired waters (Appendix B and Appendix C).

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 04/10/2000 – 02/13/2003 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Prescott, AZ VRGRA029.64 USGS #09502960 101580	USGS Ambient	3-4 dissolved samples only: Arsenic, barium, beryllium, boron, chromium, copper, manganese, selenium, silver, zinc. 1 or 2 dissolved metals: Antimony, lead, mercury, silver. No total metals and dis. cadmium.	0 total nutrients (all were dissolved only)	4 *E. coli* bacteria 2 Susp. sediment conc 1 Total dissolved solids 4 Pesticides 4 VOCs (solvents) 4 Petroleum products
Above Watson Lake VRGRA028.50 102565	AGFD Special investigation			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	7.0 mg/L A&Wc	07/16/2000 – 6.2 mg/L	Inconclusive –1 exceedance in 4 sampling events.
E. coli bacteria	235 CFU/100 ml FBC	04/10/2000 – 240 CFU/100 ml 08/25/2000 – GT 04/11/2001 – 300 CFU/100 ml	Inconclusive – 3 exceedances, but only one of them was above the screening value of 300 CFU/100 ml. (Note GT = greater than lab detection limit)
Mercury (dissolved)	0.01 µg/L Chronic A&Wc	08/25/2000 – 0.3 µg/L	Inconclusive – Only one exceedance. Laboratory detection limits were above standards in other samples.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
E. coli bacteria, dissolved mercury,	Insufficient core parameters	Insufficient sampling events.	Laboratory detection limit for dissolved mercury were higher than water quality standards.
DISCUSSION OF LOW DISSOLVED OXYGEN IMPAIRMENT		Evidence of potential impairment: 1. Elevated nitrogen at the time of low DO; 2. One low dissolved oxygen in four samples; and 3. Stream is intermittent and low dissolved oxygen may be due groundwater upwelling or other natural conditions.	
MONITORING RECOMMENDATIONS		High Priority – Collect dissolved oxygen data to support TMDL development. Collect *E. coli* and dissolved mercury data due to exceedances. Collect core parameters to represent at least 3 seasons. Use a lower lab detection limit for dissolved mercury.	

HORSESHOE RESERVOIR 15060203 – 0620 1980 Acres	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive AgI – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 09/23/2004		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At boat ramp VRHSR-BR 102758	ADEQ Fixed site		1 Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	1 Turbidity, 1 Total dissolved solids

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	6 mg/L A&Ww	09/23/2004 – 2.8 mg/L	Inconclusive – Only 1 sample, but result well below required minimum concentration.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Dissolved oxygen	Insufficient core parameters	Insufficient monitoring events.	
MONITORING RECOMMENDATIONS		Medium Priority – Collect more dissolved oxygen samples due to exceedance. Note that the old turbidity standard (25 NTU) was exceeded in the 1 sample (09/23/2994 at 179 NTU). Turbidity and low dissolved oxygen may be symptoms of excess nutrient loading. New methods for implementing the narrative nutrient standard should be applied to this lake once adopted, to determine whether narrative nutrient violations are occurring. Collect core parameters to represent at least 3 seasons during an assessment period.	

JD DAM LAKE 15060202 – 0700 28 Acres	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Inconclusive FBC – Inconclusive FC – Attaining AgI – Attaining AgL – Attaining	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 06/21/2001 – 10/31/2001 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Dam VRJDD-A 101286	ADEQ Ambient	4 total metal samples only: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, zinc.	4 samples: Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	1 *E. coli* bacteria 4 Turbidity 4 Total dissolved solids
Mid Lake VRJDD-B 102549	ADEQ Ambient			
At Boat Ramp VRJDD-BR 101318	ADEQ Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient *E. coli* bacteria and dissolved metals (cadmium, copper, and zinc) assess A&Ww and FBC.		
MONITORING RECOMMENDATIONS		Low Priority – Collect missing core parameters to represent at least 3 seasons. Note that the old turbidity standard (10 NTU) was exceeded in 1 of 4 samples (07/26/2001 at 23 NTU). Turbidity may be a symptom of excess nutrient loading. New methods for implementing the narrative nutrient standard should be applied to this lake once adopted, to determine whether narrative nutrient violations are occurring.	

MUNDS CREEK From headwaters to Oak Creek 15060202 – 415 17.0 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 08/12/2003 – 05/25/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Indian Gardens VRMUN000.27 100500	ADEQ Ambient	3-5 Total and dissolved metal samples: Antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc. 4 total metals only: Boron, manganese	4-5 samples: Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	5 *E. coli* bacteria 5 Suspended sediment concentration 4 Total dissolved solids

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters	All seasons were represented.	
MONITORING RECOMMENDATIONS		Low Priority – Collect samples during the next watershed cycle.	

OAK CREEK From headwaters to West Fork Oak Creek 15060202 – 019 7.4 Miles Unique Water	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Wc – Attaining FBC – Impaired FC – Attaining DWS – Attaining AgI – Attaining AgL – Attaining	Category 5 Impaired	*E. coli* bacteria	Add to 303(d) List. Expand Phase II bacteria TMDL to include this reach of Oak Creek

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 07/1/2003 – 01/11/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Sterling Springs Fish Hatchery VROAK 050.55 101882	ADEQ TMDL	3-5 dissolved and total samples: Antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, manganese, zinc. 4 total metals samples: Boron, manganese 1 total metals: Nickel	18-27 Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	26 *E. coli* bacteria 4 Fluoride 27 Suspended sediment concentration, 27 Turbidity, 4 Total dissolved solids
At Coconino County stage logger VROAK050.30 101863	ADEQ TMDL			
Below Pine Flats Subdivision VROAK049.28 101864	ADEQ TMDL			
Below Pine Flat Campground VROAK048.81 100607	ADEQ Ambient and TMDL			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	235 CFU/100 ml FBC	07/30/2003 – 517 CFU/100 ml 09/04/2004 – 1203 CFU/100 ml	Impaired – 2 exceedances during the last 3 years of monitoring
Dissolved oxygen	7 mg/L A&Wc	05/29/2004 – 6.2 mg/L	Attaining – Low dissolved oxygen in 1 of 12 sampling events. (Low DO occurred at two sites on that day.) (Binomial)
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L A&Wc	01/11/2005 – 182 mg/L	Attaining – The 80 mg/L criterion was exceeded only in 1 of 26 samples. The geometric mean was not exceeded.

Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters	Collected samples during at least 3 seasons.	Lab detection limit for selenium was higher than the A&W chronic criterion.
MONITORING RECOMMENDATIONS		High Priority – Collect *E. coli* bacteria samples to support development of a TMDL. Use lower lab detection limit for selenium. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

OAK CREEK From West Fork Oak Creek to tributary at 345709/1114513 15060202 – 018A 5.0 Miles Unique Water	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Wc – Attaining FBC – Impaired FC – Attaining DWS – Attaining AgI – Attaining AgL – Attaining	Category 5 Impaired	*E. coli* bacteria	Add to 303(d) List. Expand Phase II bacteria TMDL to include this reach of Oak Creek.

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 07/01/2003 – 07/05/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Bootlegger Campground VROAK046.10 101866	ADEQ TMDL	3-4 total and dissolved metals: samples: Chromium, copper 3-4 total and 0-2 dissolved: Arsenic, boron, lead, manganese, mercury 1 total and dissolved: Antimony 1 total, 3 dissolved: Cadmium, zinc	10-11 samples: ammonia, nitrite/nitrate, and total Kjeldahl nitrogen, total phosphorus 28 samples: Dissolved oxygen and pH	25 *E. coli* bacteria 3 Fluoride 26 Suspended sediment concentration, 28 Turbidity,
At Banjo Bill Campground VROAK044.98 101867	ADEQ TMDL			
Above Slide Rock State Park VROAK044.46 101869	ADEQ TMDL			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	235 CFU/100 ml FBC	07/30/2003 – 1733 CFU/100 ml 09/04/2004 – 517 CFU/100 ml 07/02/2005 – 517 CFU/100 ml	Impaired – 3 exceedances during the last 3 years of monitoring
Dissolved oxygen	7 mg/L A&Wc	05/29/2004 – 6.1 mg/L 07/02/2005 – 6.7 mg/L	Attaining – Low dissolved oxygen is due to natural conditions of low flow and groundwater upwelling. Low nutrient levels on two dates with low DO.

Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters	None	Lab detection limits for selenium was higher than the A&Wc chronic criteria.
MONITORING RECOMMENDATIONS		High Priority – Collect *E. coli* bacteria samples to support TMDL development. Use lower lab detection limits for selenium.	

OAK CREEK From tributary at 345709 / 1114513 to downstream boundary of Slide Rock State Park 15060202 – 018B 1 Mile Unique Water	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Attaining FBC – Impaired FC – Attaining DWS – Attaining AgI – Attaining AgL – Attaining	Category 5 Impaired	*E. coli* bacteria	Phase II TMDL being developed.

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/09/2000 – 07/05/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Slide Rock VROAK044.04 101868	ADEQ TMDL & Friends of the Forest	3-5 total and dissolved: Chromium, copper, 3-5 total metals only: Arsenic, boron, lead, manganese, mercury, zinc 3-5 dissolved metals only: cadmium, zinc 0-1 total and 0-1 dissolved: Antimony, arsenic, beryllium, cadmium, lead, mercury, and zinc	15-22 samples: Ammonia, total nitrogen, nitrite/nitrate, total Kjeldahl nitrogen, total phosphorus, dissolved oxygen, and pH	938 *E. coli* bacteria 3 Fluoride 17 Suspended sediment concentration, 22 Turbidity,
Upstream of Slide VROAK043.88 102695	ADEQ TMDL & State Park Ambient			
Mid Slide VROAK043.83 102694	ADEQ TMDL & State Park Ambient			
Large Pool at Slide VROAK043.81 102693	ADEQ TMDL & State Park Ambient			
At Foot Bridge VROAK043.79 102692	ADEQ TMDL & State Park Ambient			
At Highway Bridge VROAK043.73 100609	ADEQ TMDL & State Park Ambient			
Below Slide Rock VROAK042.86 101870	ADEQ TMDL & State Park Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	235 CFU/100 ml FBC	Too many to list here.	Impaired – 58 exceedances (aggregating all sites within a 7-day period) during the assessment period. 20 exceedances in the last 3 years.
Suspended Sediment Concentration (SSC)	Geometric mean 80 mg/L A&Ww	03/10/2004 – 133 mg/L 01/11/2005 – 369 mg/L	Attaining – Although 2 exceedances of the 80 mg/L criterion, the geometric mean was not exceeded.

Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
None	Collected all core parameters		Lab detection limits for dissolved mercury and total selenium were higher than A&W chronic criteria.
MONITORING RECOMMENDATIONS		High Priority – Collect *E. coli* bacteria to support development of Phase II TMDL. Use lower lab detection limits for selenium and dissolved mercury. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

OAK CREEK From Slide Rock to Dry Creek 15060202 – 018C 20.0 Miles Unique Water	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Attaining FBC – Impaired FC – Attaining DWS – Attaining AgI – Attaining AgL – Attaining	Category 5 Impaired	*E. coli* bacteria	Add to 303(d) List. Expand Phase II bacteria TMDL to include this reach on Oak Creek

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 08/15/2001 – 07/05/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Manzanita Campground VROAK042.78 101871	ADEQ TMDL	7-22 total and dissolved samples: Antimony, arsenic , barium, beryllium, cadmium, chromium, copper, lead, silver, thallium, and zinc 21 total and 0-2 dissolved: Boron, manganese, and mercury	28-30 samples: Ammonia, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen, total phosphorus 81 samples: Dissolved oxygen and pH	276 *E. coli* bacteria 20 Fluoride 63 Suspended sediment concentration, 75 Turbidity, 18 Total dissolved solids
Below Encinoso Picnic Area VROAK041.69 101872	ADEQ TMDL			
Below Rainbow Trout Farm VROAK039.92 101873	ADEQ TMDL			
At Ladders VROAK039.54 103111	Friends of the Forest Ambient			
At Crescent Moon VROAK038.67 101876	Friends of the Forest Ambient			
Above Grasshopper Point VROAK038.52 101875	ADEQ TMDL			
Below Highway 179 VROAK035.79 100460	ADEQ TMDL			
At Chavez VROAK034.02 100461	ADEQ TMDL and Friends of the Forest			
At Grasshopper Point VROAK031.52 101874	Friends of the Forest Ambient			
At Red Rock Crossing VROAK031.38 100926	ADEQ TMDL			

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	235 CFU/100 ml FBC	23 7-day periods with exceedances (Too many to list here)	Impaired – At least one exceedance in the 10 sites during 23 7-day periods. 276 samples were collected at all 10 sites to support a TMDL being developed.
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L A&Ww	07/30/2003 – 514 mg/L 01/11/2005 – 166 mg/L 07/01/2005 – 253 mg/L	Attaining – Although there were 3 exceedances of the 80 mg/L criterion, the geometric mean of 4 consecutive samples was not exceeded.

Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
None	All core parameters collected.		Lab detection limits for dissolved mercury and total selenium were higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		High Priority – Collect *E. coli* bacteria samples to support TMDL development. Use lower lab detection limits for selenium and dissolved mercury. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted	

OAK CREEK From Dry Creek to Spring Creek 15060202 – 017 10.0 Miles Unique Water	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Attaining FBC – Impaired FC – Attaining DWS – Attaining AgI -- Attaining AgL – Attaining	Category 5 Impaired	*E. coli* bacteria	Add to the 303(d) List. Expand Phase II bacteria TMDL to include this reach of Oak Creek

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/10/2001 – 05/24/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Dry Creek VROAK022.58 101878	ADEQ TMDL	3-4 dissolved and total samples: Antimony, arsenic, beryllium, cadmium, chromium, copper, zinc 4 total and 0-2 dissolved: Boron, lead, manganese, mercury	7-9 samples: Ammonia, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen, total phosphorus 12 samples: Dissolved oxygen and pH	102 *E. coli* bacteria 4 Fluoride 12 Suspended sediment concentration 12 Turbidity 4 Total dissolved solids
Below Page Springs VROAK016.70 100613	ADEQ TMDL			
At Mormon Crossing VROAK013.95 101880	Friends of the Forest TMDL			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	235 CFU/100 ml FBC	8/15/2001 – GT 10/21/2001 – 1348 CFU/100 ml 11/21/2001 – 1809 CFU/100 ml 12/07/2001 – 308 CFU/100 ml 09/11/2002 – 1011 CFU/100 ml 08/06/2003 – 921 CFU/100 ml 08/27/2003 – 613 CFU/100 ml 09/03/2003 – 830 CFU/100 ml 06/22/2004 – 687 CFU/100 ml 07/20/2004 – 461 CFU/100 ml 09/21/2004 – 613 CFU/100 ml 01/11/2005 – 365 CFU/100 ml	Impaired – The *E. coli* criterion was exceeded in 12 of 102 samples. Sampling was conducted to determine the extent of impairment on Oak Creek (upstream reach was already assessed as impaired 15060202-018B). (GT = "greater than," which is more colonies than could be counted)
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L A&Ww	03/09/2004 – 144 mg/L 01/11/2005 – 460 mg/L	Attaining – Although 2 samples exceeded the 80 mg/L criterion, both exceedances occurred during high flows, so can not be included in the geometric mean calculation. Geometric mean was not exceeded.

Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for dissolved mercury, dissolved lead, and total selenium were higher than the criteria.
MONITORING RECOMMENDATIONS		High Priority – Collect *E. coli* bacteria to support TMDL development. Use lower lab detection limits for dissolved mercury, lead, and total selenium. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted	

OAK CREEK From Spring Creek to Verde River 15060202 – 016 12.7 Miles Unique Water	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining DWS – Attaining AgI – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 08/11/2003 – 05/24/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Cornville Bridge VROAK008.90 101881	ADEQ TMDL	3-4 dissolved and total samples: Antimony, arsenic, cadmium, chromium, copper, lead, zinc 4 total and 0-1 dissolved metals: Boron, manganese, and mercury	3-10 samples: Ammonia, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen, total phosphorus, dissolved oxygen, and pH	10 *E. coli* bacteria 4 Fluoride 10 Suspended sediment concentration 10 Turbidity, 4 Total dissolved solids
Near Cornville VROAK000.21 USGS #09504500 100493	ADEQ Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L	03/08/2004 – 106 mg/L	Attaining – Exceeded 80 mg/L in one of 10 samples; however, exceedance was during a high flow event, so value could not be included in geometric mean calculation. Geometric mean did not exceed criterion.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
None	All core parameters collected.		Lab detection limits for dissolved mercury and total selenium were higher than the criteria.
MONITORING RECOMMENDATIONS		Low Priority – Use lower lab detection limits for selenium and dissolved mercury. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

PECKS LAKE 15060202 – 1060 95 Acres	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Wc – Impaired FBC – Attaining FC – Attaining AgI – Attaining AgL – Attaining	Category 4A Not attaining	Low dissolved oxygen and high pH.	TMDL approved in 2000.

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 01/13/2000, 03/12/2002, 03/31/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Dam VRPEC-AA 100511	ADEQ Ambient	3 total and 0-1 dissolved sample: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, zinc	3: Ammonia, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen, total phosphorus, dissolved oxygen, and pH	2 *E. coli* bacteria 3 Fluoride 3 Turbidity 3 Total dissolved solids
Mid Lake VRPEC-A 100063	ADEQ Ambient			
At Inlet VRPEC-F 100513	ADEQ Ambient			
At Verde River Inlet VRPEC-IN 100827	ADEQ Ambient			
East of Cement Bridge VRPEC-OUT 100828	ADEQ Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	7 mg/L A&Wc	01/13/2000 – 2.1 mg/L	Remains impaired – Insufficient data to change impairment status. (Binomial)

Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient dissolved metals (cadmium, copper, and zinc) and *E. coli* bacteria to assess A&W and FBC.	Only 2 season represented (January and March samples)	Lab detection limit for dissolved mercury was above A&W chronic criterion.
MONITORING RECOMMENDATIONS		Medium Priority – Collect samples during critical conditions to determine the effectiveness of watershed improvements to reduce nutrient loadings. The old turbidity standard (10 NTU) was exceeded in 1 of 3 samples (16 NTU). Elevated turbidity and low dissolved oxygen may be symptoms of excess nutrient loading. New methods for implementing the narrative nutrient standard should be applied to this lake once adopted, to determine effectiveness of TMDL load reduction strategies. Collect core parameters during at least 3 seasons. Use a lower lab detection limit for dissolved mercury.	

PERKINS LAKE 15060202 – 1080 4 Acres	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Inconclusive FBC – Inconclusive FC – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 05/22/2001 – 09/06/2001		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Dam VRPER-A 101295	ADEQ Ambient	1-2 total metals samples:: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, nickel, selenium, silver, zinc (0 dissolved metals)	3 samples: Ammonia, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen, and pH 2 Dissolved oxygen 1 Phosphorus	3 Fluoride 3 Turbidity 2 Total dissolved solids

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	7 mg/L A&Wc	09/06/2001 – 6.2 mg/L 05/22/2001 – 4.6 mg/L	Inconclusive – Low dissolved oxygen in the top meter of the lake during both sampling events.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Dissolved oxygen	Insufficient dissolved metals (cadmium, copper, and zinc) and *E. coli* bacteria to assess A&W and FBC.	Only 2 season represented (January and March samples)	
MONITORING RECOMMENDATIONS		Medium Priority – Collect additional dissolved oxygen data due to low measurements. Low dissolved oxygen may be a symptom of excess nutrient loading. New methods for implementing the narrative nutrient standard should be applied to this lake once adopted, to determine whether narrative nutrient violations are occurring. Collect core parameters to represent at least 3 seasons during an assessment period.	

RED CREEK From headwaters to Verde River 15060203 – 818 13.6 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 09/29/2003 – 04/28/2004		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above second road crossing VRRED004.17 100626	ADEQ Ambient	3-4 dissolved and total samples: Antimony, arsenic, beryllium, cadmium, copper, lead, manganese, mercury, zinc. 4 total metals samples only: Boron, chromium, manganese	3-4 Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	4 *E. coli* bacteria 4 Fluoride 4 Suspended sediment concentration, 4 Turbidity, 4 Total dissolved solids

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
None	All core parameters collected		Lab detection limit for selenium was higher than A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – Use lower lab detection limits for selenium data.	

ROUNDTREE CANYON CREEK From headwaters to Tangle Creek 15060203 – 853 10.7 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Attaining FC – Attaining AgL – Attaining	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 09/29/2003 – 04/28/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
3 miles above Tangle Creek VRROU002.93 100631	ADEQ Fixed site	3-4 dissolved and total samples: Antimony, arsenic, beryllium, boron, cadmium, copper, lead, manganese, mercury, zinc. 4 total metals samples only: Boron, chromium, manganese samples	3-4 samples: Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	4 *E. coli* bacteria 4 Fluoride 4 Suspended sediment concentration, 4 Turbidity, 4 Total dissolved solids

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	6.0 mg/L A&Ww	09/29/2003 – 5.5 mg/L	Attaining – Exceedance due to natural conditions with flow less than 0.1 cfs and ground water upwelling the source of water.
Copper (dissolved)	18.9 µg/L at 240 mg/L hardness A&Ww chronic	01/27/2004 – 20 µg/L	Inconclusive – 1 exceedance during the assessment period.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Copper	All core parameters collected		Lab detection limit for selenium was higher than the A&W chronic criterion.
MONITORING RECOMMENDATIONS		Medium Priority – Collect copper samples due to exceedances. Use a lower lab detection limit for selenium samples.	

SCHOLZE LAKE 15060202 – 1350 22 Acres	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Attaining FC – Attaining AgL – Attaining	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 07/27/2001-6/20/2002 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Dam VRSCH-A 101295	ADEQ Ambient	3 total and 0-1 dissolved sample:: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, zinc	4 samples: Ammonia, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen, total phosphorus, dissolved oxygen, and Ph	1 *E. coli* bacteria 4 Fluoride 3 Turbidity 3 Total dissolved solids

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	6 mg/L A&Ww	10/29/2001 – 4.8 mg/L	Inconclusive – Low dissolved oxygen in 1 of 3 sampling events. (Binomial)

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Dissolved oxygen	Insufficient dissolved metals (cadmium, copper, and zinc), total hardness, and *E. coli* bacteria to assess A&W and FBC.	Only 2 season represented (Sept-Oct and May samples)	Lab detection limits for dissolved metals (cadmium, copper, mercury, and silver) were higher than A&W chronic criteria.
MONITORING RECOMMENDATIONS		Medium Priority – Collect dissolved oxygen measurements due to the low dissolve oxygen. Collect core parameters during at least three different seasons during the assessment period. The old turbidity standard (25 NTU) was exceeded in 1 of 3 samples (09/07/2001 at 77 NTU). Low dissolved oxygen and elevated turbidity may be symptoms of excess nutrient loading. New methods for implementing the narrative nutrient standard should be applied to this lake once adopted, to determine whether narrative nutrient violations are occurring Use lower lab detection limits for dissolved metals.	

SPRING CREEK From Coffee Creek to Oak Creek 15060202 – 022 6.4 Miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Attaining FBC – Impaired FC – Attaining AgI – Attaining AgL – Attaining	Category 5 Impaired	*E. coli* bacteria	Add to the 303(d) List. Expand Phase II bacteria TMDL to include this tributary to Oak Creek

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 08/15/2001 – 01/11/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Willow Point Road VRSPN002.09 101879	Friends of the Forest Bacteria	3-4 dissolved and total samples: Antimony, arsenic, beryllium, cadmium, copper, lead, and zinc. 4 total metals and 0-2 dissolved metals: Boron, chromium, manganese, and mercury	3-7 samples: Total phosphorus, total Kjeldahl nitrogen, total nitrogen, nitrite/nitrate, ammonia, dissolved oxygen, and pH	97 *E. coli* bacteria 4 Fluoride 7 Suspended sediment concentration, 7 Turbidity, 4 Total dissolved solids
Near Road Crossing VRSPN002.04 100650	ADEQ Ambient TMDL			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	235 CFU/100 ml FBC	08/15/2001 – 3629 CFU/100 ml 10/10/2001 – 387 CFU/100 ml 07/31/2002 – 461 CFU/100 ml 08/21/2002 – 248 CFU/100 ml 08/28/2002 – 328 CFU/100 ml 09/11/2002 – 1011 CFU/100 ml 09/03/2003 – 308 CFU/100 ml 09/10/2003 – 548 CFU/100 ml 07/20/2004 – 291 CFU/100 ml	Impaired –7 exceedances during the last 3 years of monitoring (9 during the assessment period). Of these, 7 were above the 300 CFU/100 ml screening value.
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L A&Ww	01/11/2005 – 310 mg/L	Attaining – 80 mg/L was exceeded in one sample; however, that sample was collected during a high flow event, so could not be included in the geometric mean calculation. Geometric mean standard was not exceeded.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	All core parameters collected		Lab detection limit for selenium and dissolved mercury were higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		High Priority – Collect *E. coli* bacteria samples to support development of a TMDL. Use lower detection limits for selenium and dissolved mercury. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

STERLING CANYON From headwaters to Oak Creek 15060202 – 424 3.0 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Inconclusive FC – Inconclusive	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 01/28/2004, 05/24/2005 NUMBER AND TYPES OF SAMPLES Metals	Nutrients – Related	Other
Above Sterling Spring Hatchery VRSTC000.10 101923	ADEQ Ambient	1 dissolved and total metal samples: Cadmium, chromium, copper, lead, thallium, zinc 1 total metals only: Antimony, arsenic, barium, beryllium, boron, manganese, mercury, nickel, selenium	2-3 samples: Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	2 *E. coli* bacteria 1 Turbidity

EXCEEDANCE

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	6.0 mg/L A&Ww	05/24/2005 – 4.5 mg/L	Attaining – Low dissolved oxygen is naturally occurring due to low flow conditions and groundwater upwelling. Nutrients were very low.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Insufficient sampling events	
MONITORING RECOMMENDATIONS		Low Priority – Collect core parameters to represent at least 3 seasons during an assessment period.	

STONEMAN LAKE 15060202 – 1490 125 Acres	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Wc – Impaired FBC – Inconclusive FC – Inconclusive AgI – Inconclusive AgL – Inconclusive	Category 4A Not attaining	Low dissolved oxygen and high pH	TMDL approved in 2000. Several watershed improvements completed.

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 03/29/2001- 06/01/2001 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Dam VRSTN-A 100086	ADEQ Ambient	1-2 total metals samples: only: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, zinc (0 dissolved metals)	3 samples: Ammonia, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen, total phosphorus. 2 pH (0 Dissolved oxygen)	2 Fluoride 2 Turbidity 1 Total dissolved solids
Mid Lake VRSTN-B 100698	ADEQ Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Arsenic	50 µg/L FBC	03/29/2001 – 70.6 µg/L 05/09/2001 – 107 µg/L	Inconclusive – Exceeded in 2 of 2 samples collected. (Binomial requires a minimum of 5 exceedances and 20 samples to assess as impaired.) Lake was drying down at that time and has been totally dry most of the time since 2001.
pH	<9.0 SU A&Wc, FBC, AgI, AgL	06/01/2001 – 9.4 mg/L	Attaining – Low pH was a natural condition as lake evaporated.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Arsenic	Missing core parameters.	Only 2 season represented (March, May, June samples)	
MONITORING RECOMMENDATIONS		Medium Priority – Collect samples to determine the effectiveness of implemented strategies to reduce nutrient loading to the lake once the lake refills and water quality stabilizes. (Note that the lake has been completely dry for the past 3 years.) New narrative nutrient implementation procedures are being adopted and should be applied to this lake once water in the lake has been reestablished. Collect arsenic samples due to exceedances. Collect core parameters to represent at least three seasons during an assessment period.	

SYCAMORE CREEK From Cedar Creek to Verde River 15060202 – 026 11.7 miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining AgI - Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 06/14/2000; 11/13/2003 - 06/22/2004 NUMBER AND TYPES OF SAMPLES Metals	Nutrients – Related	Other
Below Summer Springs VRSYW001.72	ADEQ Ambient	3-4 dissolved and total samples: Antimony, arsenic, beryllium cadmium, copper, lead, zinc 4 total and 0-1 dissolved: Boron, chromium, manganese, and mercury	3-4 samples: Ammonia, dissolved oxygen, pH, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen	4 *E. coli* bacteria 4 Fluoride 4 Suspended sediment concentration, 4 Turbidity, 3 Total dissolved solids
At mouth to Verde River VRSYW000.05 101558	USGS Special study			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and dissolved mercury were higher than A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – The old turbidity standard (50 NTU) was exceeded in only 1 of 4 samples (05/13/2004 at 97 NTU). Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted. Use lower lab detection limits for selenium and dissolved mercury.	

SYCAMORE CREEK From headwaters to Verde River 15060203 – 055 13.2 miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 09/30/2003 – 04/29/2004		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Sheeps Bridge VRSYH000.25 100656	ADEQ Fixed site	3-4 dissolved and total samples: Antimony, arsenic, beryllium, boron, cadmium, copper, lead, manganese, mercury, zinc. 4 total metals samples only: Boron, chromium, manganese	3-4 Ammonia, dissolved oxygen, pH, nitrite/nitrate, total nitrogen, total phosphorus, and total Kjeldahl nitrogen	4 *E. coli* bacteria 4 Fluoride 4 Suspended sediment concentration, 4 Turbidity, 4 Total dissolved solids

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	All core parameters collected		Lab detection limit for selenium was higher than the A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – Use lower lab detection limits for selenium.	

VERDE RIVER From Granite Creek to Hell Canyon 15060202 – 052 16.4 miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining AgI - Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 06/13/2000 – 06/23/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Granite Creek VRVER187.15 101556	USGS Special Study	3-5 dissolved and total samples: Antimony, arsenic, beryllium, cadmium, chromium, zinc 5 total and 1-2 dissolved metals: Boron, copper, lead, manganese, mercury	4-7 samples: Ammonia, dissolved oxygen, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen, total phosphorus 16 samples: pH	4 *E. coli* bacteria 5 Fluoride 6 Suspended sediment concentration, 7 Turbidity, 5 Total dissolved solids
At Inscription Point VRVER185.21 100764	USGS and ADEQ Special Study			
Above Muldoon Cyn. VRVER181.03 102172	USGS Special Study			
Below Muldoon Cyn. VRVER180.99 102173	USGS Special Study			
At gage near Pauldin VRVER179.25 USGS # 09503700 100488	USGS Ambient			
At Bull Basin Canyon VRVER177.42 101566	USGS Special Study			
Above Duff Spring VRVER175.01 101564	USGS Special Study			
Below Duff Spring 2 VRVER174.73 101563	USGS Special Study			
Above Hell Canyon VRVER171.11 101571	USGS Special Study			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters	None	Lab detection limits for dissolved mercury and selenium were higher than chronic A&W criteria.
MONITORING RECOMMENDATIONS		Low Priority – Use lower lab detection limits for selenium and dissolved mercury.	

VERDE RIVER From unnamed tributary (15060202-065) to Railroad Draw 15060202 – 037 10.7 miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Impaired FBC – Attaining FC – Attaining AgI - Attaining AgL – Attaining	Category 4A Not attaining	Turbidity	Turbidity TMDL completed in 2002. (See comment below)

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/02/2000 – 04/20/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Perkinsville Bridge VRVER164.63 100487	ADEQ & USGS Ambient	7-24 dissolved and total samples: Antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, silver, thallium, and zinc 21-24 total metals only: Boron, manganese 2 Mercury dissolved	21-24 samples: Ammonia, dissolved oxygen, pH, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen, total phosphorus	20 *E. coli* bacteria 22 Fluoride 12 Suspended sediment concentration, 22 Turbidity, 18 Total dissolved solids
Below Spring at Perkinsville Bridge VRVER163.19 101569	USGS Special Study			
Below Orchard fault VRVER162.32 101567	USGS Special Study			
Above Mormon Pocket VRVER159.89 101565	USGS Special Study			
Near bench mark #1813 VRVER154.70 101562	USGS Special Study			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Arsenic	50 µg/L – FBC 200 µg/L – AgI	02/02/2000 – 240 µg/L	Attaining – Only 1 exceedance in 22 samples. (Binomial)
E. coli bacteria	235 CFU/100 ml FBC	08/27/2002 – 600 CFU/100 ml	Attaining – No exceedances in the last 3 years of monitoring (only 1 during the assessment period).
Mercury	0.6 µg/L FC	04/16/2002 – 0.79 µg/L	Attaining – Only 1 exceedance in 20 samples. (Binomial)

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
E. coli bacteria	Collected all core parameters		Lab detection limits for dissolved mercury and selenium were higher than the chronic A&W criteria.
TURBIDITY IMPAIRMENT		Need to re-evaluate the turbidity TMDL developed in 2002 in terms of the new suspended sediment concentration (SSC) standard. None of the 12 SSC samples exceeded 80 mg/L, although 4 samples marginally exceeded the old turbidity standard (50 NTU).	
MONITORING RECOMMENDATIONS		Medium Priority – Collect more *E. coli* bacteria samples due to the exceedance. Continue to evaluate turbidity and suspended sediment. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted. Use lower lab detection limits for dissolved mercury and selenium.	

VERDE RIVER From Sycamore Creek to Oak Creek 15060202 – 025 25.2 Miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Impaired FBC – Attaining FC – Attaining AgI - Attaining AgL – Attaining	Category 4A Not attaining	Turbidity	Turbidity TMDL completed in 2002. (See comment below)

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 06/14/2000 – 09/09/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Half-mile below Sycamore Creek VRVER151.95 101555	USGS Special study	19-20 total and dissolved samples: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, nickel, selenium, silver, thallium, and zinc 20 total mercury (no dissolved)	19-20 samples: Ammonia, dissolved oxygen, pH, total phosphorus, total nitrogen, TKN, nitrite/nitrate	20 *E. coli* bacteria 20 Fluoride 20 Suspended sediment concentration 19 Turbidity 20 Total dissolved solids
Near Clarkdale VRVER150.65 USGS # 09504000 100738	USGS Ambient			
Above Railroad Trestle VRVER147.23 101554	USGS Special study			
Below Railroad Trestle VRVER146.91 101553	USGS Special study			
Above diversion dam VRVER142.16 101551	USGS Special study			
Below diversion dam VRVER140.64 101547	USGS Special study			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	235 CFU/100 ml FBC	11/01/2000 – 240 CFU/100 ml	Attaining – No exceedances in last three years (16 samples since exceedance). (Screening value of 300 CFU was not exceeded.)
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L	01/12/2000 – 84 mg/L	Attaining – Exceeded 80 mg/L criterion in 1 of 20 samples. Geometric mean was not exceeded.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	All core parameters collected.		Lab detection limit for selenium was higher than the A&W chronic standard.
TURBIDITY IMPAIRMENT		Need to re-evaluate the turbidity TMDL developed in 2002 in terms of the new suspended sediment concentration (SSC). Only 1 of 20 SSC samples exceeded the 80 mg/L.	
MONITORING RECOMMENDATIONS		Medium Priority – Continue to evaluate turbidity and suspended sediment. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted. Use a lower lab detection limit for selenium.	

VERDE RIVER From Oak Creek to Beaver Creek 15060202 – 015 12.2 Miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Impaired FBC – Attaining FC – Attaining AgI - Attaining AgL – Attaining	Category 4A Not attaining	Turbidity	Turbidity TMDL completed in 2002. (See comment below)

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 11/12/2003 – 06/22/2004		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At 1000 Trails Mobile Home Park VRVER127.02 100481	ADEQ Ambient	3-4 total and dissolved samples: Antimony, arsenic, beryllium, cadmium, and zinc 4 total only: Boron, manganese 4 total and only 2 dissolved: Chromium, copper, lead, mercury	3-4 samples: Ammonia, dissolved oxygen, pH, total phosphorus, total nitrogen, TKN, nitrite/nitrate	4 *E. coli* bacteria 4 Fluoride 4 Suspended sediment concentration 3 Turbidity 4 Total dissolved solids

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
No exceedances	Insufficient dissolved copper to assess A&W		Lab detection limit for selenium was higher than the A&W chronic criteria.
TURBIDITY IMPAIRMENT		Need to re-evaluate the turbidity TMDL developed in 2002 in terms of the new suspended sediment concentration (SSC). The SSC samples did not exceed 80 mg/L.	
MONITORING RECOMMENDATIONS		Medium Priority – Continue to evaluate turbidity and suspended sediment. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted. Collect missing core parameters (dissolved copper) to represent at least 3 seasons during the assessment period. Use a lower lab detection limit for selenium.	

VERDE RIVER From 15060203 boundary to West Clear Creek 15060203 – 027 6.4 miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Impaired FBC – Attaining FC – Attaining AgI - Attaining AgL – Attaining	Category 4A Not attaining (Impaired)	Turbidity	Turbidity TMDL completed in 2002. (See comment below)

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 10/08/2003 – 06/21/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above West Clear Creek VRVER107.68 100723	ADEQ Ambient	3-4 dissolved and total: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, zinc. 4 total and 2 dissolved: Mercury. 1 Barium	4 Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, and total Kjeldahl nitrogen	3 *E. coli* bacteria 4 Fluoride 4 Suspended sediment concentration, 4 Turbidity, 4 Total dissolved solids

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	All core parameters collected.		Lab detection limits for selenium and dissolved mercury were higher than A&W chronic criteria.
TURBIDITY IMPAIRMENT		Need to re-evaluate the turbidity TMDL developed in 2002 in terms of the new suspended sediment concentration (SSC). The SSC samples did not exceed 80 mg/L.	
MONITORING RECOMMENDATIONS		Medium Priority – Continue to evaluate turbidity and suspended sediment concentration. Use lower lab detection limits for dissolved mercury and total selenium.	

VERDE RIVER From West Clear Creek to Fossil Creek 15060203 – 025 23.6 miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Impaired FBC – Attaining FC – Attaining Agi - Attaining AgL – Attaining	Category 4A Not attaining	Turbidity	Turbidity TMDL completed in 2002. (See comment below)

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/01/2000 – 04/21/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Beasley Flat VRVER103.73 100677	USGS Ambient	5-24 dissolved and total: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, nickel, silver, thallium, and zinc.	22-24 Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, and total Kjeldahl nitrogen	20 *E. coli* bacteria 22 Fluoride 11 Suspended sediment concentration, 17 Turbidity, 18 Total dissolved solids
At Beasley Flat VRVER103.60 100477	ADEQ Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	235 CFU/100 ml FBC	08/26/2002 – 307 CFU/100 ml	Attaining – No exceedances in the last 3 years of monitoring. (11 samples since the 1 exceedance)
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L	12/15/2004 – 105 mg/L	Attaining – Only 1 of 11 samples exceeded the 80 mg/L criterion. The geometric mean of 4 consecutive samples was not exceeded.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	All core parameters collected.		Lab detection limits for dissolved mercury and total selenium higher than A&W chronic criteria.
TURBIDITY IMPAIRMENT		Need to re-evaluate the turbidity TMDL developed in 2002 in terms of the new suspended sediment concentration (SSC). Only 1 of 11 SSC samples exceeded the 80 mg/L.	
MONITORING RECOMMENDATIONS		Medium Priority – Continue to evaluated turbidity and suspended sediment concentration impacts in this reach. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted. Use lower lab detection limits for dissolved mercury and total selenium.	

VERDE RIVER From Tangle Creek to Ista Flat 15060203 – 018 4.1 miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining AgI – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 03/29/2000 – 08/13/2004 NUMBER AND TYPES OF SAMPLES Metals	Nutrients – Related	Other
Below Sheep Bridge VRVER053.70 100678	ADEQ Ambient	18-23 dissolved and total: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, nickel, selenium, silver, thallium, and zinc. 22 total metals and 4 dissolved: Mercury	22-23 Ammonia, dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, and total Kjeldahl nitrogen	22 *E. coli* bacteria 22 fluoride 23 suspended sediment concentration, 22 turbidity, 22 total dissolved solids
Below Tangle Creek VRVER053.21 USGS #09508500 100740	USGS Fixed site			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
E. coli bacteria	235 CFU/100 ml FBC	08/30/2000 – 770 CFU/100 ml	Attaining – No exceedances in the last 3 years or monitoring (21 samples).
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L	08/30/2000 – 106 mg/L 08/13/2004 – 103 mg/L	Attaining – 2 of 23 samples exceeded the 80 mg/L criterion. The geometric mean of 4 consecutive samples did not exceed the standard.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	All core parameters collected.		
MONITORING RECOMMENDATIONS		Low Priority – Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

VERDE RIVER From Horseshoe Dam to Alder Creek 15060203 – 008 10.7 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive DWS – Inconclusive AgI – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATE: 09/23/2004 (both sites)		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Horseshoe Dam VRVER044.71 102836	AGFD Ambient		1 samples: Ammonia, total nitrogen, total Kjeldahl nitrogen, nitrite/nitrate, dissolved oxygen, pH	1 Turbidity, 1 Total dissolved solids
Below Horseshoe Dam VRVER040.13 100831	ADEQ Ambient			

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Insufficient sampling events.	
MONITORING RECOMMENDATIONS		Low Priority – Collect core parameters to represent at least 3 seasons during the assessment period.	

VERDE RIVER From Bartlett Dam to Camp Creek 15060203 – 004 6.85 Miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Attaining FBC – Attaining FC – Attaining DWS – Attaining AgI – Attaining AgL – Attaining	Category 1 Attaining all uses		Delist copper and selenium. (See comments below)

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/02/2000 – 08/18/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Bartlett Lake VRVER022.53 USGS #09510000 100741	USGS Ambient	22 dissolved and total: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, nickel, selenium, silver, thallium, and zinc. 22 total mercury.	15-18: Ammonia, total nitrogen, total Kjeldahl nitrogen, total phosphorus, nitrite/nitrate, pH, dissolved oxygen	21 or more: suspended sediment concentration, total dissolved solids, turbidity, temperature, *E. coli* bacteria

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	All core parameters collected.		Lab detection limit for dissolved mercury was higher than the A&W chronic criteria.
DISCUSSION OF COPPER IMPAIRMENT		Delist copper. No exceedances in 22 total and dissolved copper samples. No known probable sources of copper in this reach or on its tributaries. Delist selenium. No exceedances in 22 total selenium samples. No reported selenium exceedances in the entire watershed.	
MONITORING RECOMMENDATIONS		Low Priority – Use lower lab detection limit for dissolved mercury.	

WALNUT CREEK From Apache Creek to Big Chino Wash 15060201 – 017 20.1 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 03/01/2004 – 05/03/2004 (dry in summer) NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Forest Road #95 VRWAL018.97 100681	ADEQ Ambient	1-2 dissolved and total samples: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, zinc. 1 total metal only: Mercury	2 samples: Dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, and total Kjeldahl nitrogen. 4 samples: Ammonia	2 *E. coli* bacteria 2 Fluoride 2 Suspended sediment concentration, 2 Turbidity, 2 Total dissolved solids

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Only 2 seasons represented	Lab detection limits for dissolved metals (copper, lead, mercury) and selenium were higher than A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – Collect core parameters to represent at least 3 seasons during an assessment period. Use lower lab detection limits for dissolved mercury, dissolved copper, dissolved lead, and total selenium.	

WATSON LAKE 15060202 – 1590 150 Acres	USE SUPPORT		OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A D E Q	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive AgI – Inconclusive AgL – Inconclusive	Category 3 Inconclusive		
	E P A	A&Ww – Impaired FBC – Impaired AgI – Impaired AgL – Impaired	Category 5 Impaired	Nitrogen, dissolved oxygen, and pH	EPA listed lake as impaired in 2004.

Light blue highlights indicate EPA impairments based on EPA assessment and listing criteria. This listing may change when EPA reviews and approves the 2006/2008 impaired waters list. Such listings do not satisfy requirements established in ADEQ's Impaired Water Identification Rule; therefore, they are not included in the list of ADEQ's Impaired waters (Appendix B and Appendix C).

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 07/06/2000 – 08/06/2003		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Dam VRWAT-A 101353	ADEQ & AGFD Ambient	4 total and dissolved metals samples: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, nickel, selenium, silver, zinc 4 total metals only: Mercury	5 samples: Ammonia, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen, total phosphorus, dissolved oxygen, and pH	4 *E. coli* bacteria 4 Fluoride 4 Turbidity 5 Total dissolved solids
At south end of lake VRWAT-SO 102564	AGFD Fish Kill Investigation			
At boat ramp VRWAT-BR 101397	AGFD & AGFD Ambient			

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES – EXCEEDANCE	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	<6 mg/L A&Ww	05/23/2002 – 5.6 mg/L	Inconclusive – Dissolved oxygen was too low in 1 of 4 sample dates at 2 sites. (Binomial)
Total Nitrogen	>3 mg/L A&Ww, FBC	07/06/2000 – 4.05 mg/L 05/23/2002 – 3.1 mg/L 08/29/2002 – 4.85 mg/L	Inconclusive – 3 of 6 samples exceeded the criterion. (Binomial) Nitrogen exceedance on 07/06/2000 occurred during a fish kill investigation.
pH	<9.0 SU A&Ww, FBC, AgI, AgL	07/06/2000 – 9.8 SU	Inconclusive -- High pH readings at several sites during the fish kill investigation on 07/06/2000.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	**MISSING CORE PARAMETERS**	**MISSING SEASONAL DISTRIBUTION**	**DETECTION LIMITS NOT LOW ENOUGH**
	Collected all core parameters		Lab detection limit for dissolved mercury is higher than A&W chronic criterion.
DISCUSSION OF IMPAIRMENTS		Evidence of potential nutrient impairment (nitrogen, low DO, and pH): 1. No additional data since the last assessment; 2. Exceedances occurred during a fish kill investigation; and 3. Repeated elevated nitrogen values compared to standards.	
MONITORING RECOMMENDATIONS		High Priority –Collect samples to support TMDL development. Low dissolved oxygen, high pH, and elevated nutrients may be symptoms of excess nutrient loading. New methods for implementing the narrative nutrient standard should be applied to this lake once adopted, to determine whether narrative nutrient violations are occurring.	

WEST CLEAR CREEK From Meadow Canyon to Verde River 15060203 – 026B 23.5 miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining AgI – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/11/2000 – 08/18/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Near Camp Verde VRWCL010.66 USGS #09505800 100749	USGS Ambient	3-4 dissolved and total samples: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, zinc. 4 total and 0-1 dissolved: Boron, beryllium, and mercury	26-33 samples: Dissolved oxygen, pH, total nitrogen, total phosphorus, nitrite/nitrate, and total Kjeldahl nitrogen. 4 samples: Ammonia	3 *E. coli* bacteria 4 Fluoride 4 Suspended sediment concentration, 4 Turbidity, 4 Total dissolved solids 8 Pesticides (e.g. DDE, carbofuran, etc)

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
No exceedances	All core parameters collected		Lab detection limits for dissolved mercury and total selenium were higher than A&W chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority – Use lower lab detection limits for dissolved mercury and total selenium.	

WEST FORK OAK CREEK From headwaters to Oak Creek 15060202 – 020 15.8 Miles Unique Water	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Attaining FBC – Attaining FC – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 08/13/2003 – 05/27/2004		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above 4th trail crossing VRWOK000.82 100693	ADEQ Ambient	3-4 dissolved and total samples: Antimony, arsenic, beryllium, cadmium, chromium, copper, zinc 4 total and 0-2 dissolved: Boron, manganese, mercury, lead	4-7 samples: Ammonia, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen, total phosphorus, dissolved oxygen and pH	7 *E. coli* bacteria 4 Fluoride 7 Suspended sediment concentration 7 Turbidity 4 Total dissolved solids
At Mouth VRWOK000.10 101865	ADEQ TMDL			

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	7.0 mg/L A&Wc	8/13/2003 – 6.3 mg/L	Attaining – Low dissolved oxygen due to natural conditions of low flow and groundwater upwelling. (Drought conditions and flow reduced to 0.5 cfs.) Low nitrogen and phosphorus levels.
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L A&Wc	01/11/2005 – 524 mg/L	Attaining – The 1 sample that exceeded the 80 mg/L was collected during a high flow event, so the value could not be used in the geometric mean calculation. The geometric mean of 4 consecutive samples did not exceed the standard.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
None	All core parameters collected.		Lab detection limit for selenium was higher than the A&W chronic criterion.
MONITORING RECOMMENDATIONS		Low Priority – Use lower lab detection limit for selenium. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

WET BEAVER CREEK From Long Canyon to Rarick Creek 15060202 – 004 6.5 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Attaining FBC – Attaining FC – Attaining AgI – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 10/08/2003 – 05/18/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At USGS gage near Rimrock #09505200 VRWBV012.35 100497	USGS Ambient	3-4 dissolved and total samples: Antimony, barium, boron, cadmium, chromium, copper, lead, manganese, zinc. 4 total and 1 dissolved: Beryllium	3-4 samples: Ammonia, dissolved oxygen, pH, total phosphorus, total nitrogen, total phosphorus, nitrite/nitrate	3 E. coli bacteria 3 Suspended sediment 4 Turbidity 4 Total dissolved solids

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
No exceedances	All core parameters collected.		Lab detection limits for selenium and dissolved metals (copper, lead, and mercury) were higher than A&W chronic criteria in at least 1 sample.
MONITORING RECOMMENDATIONS		Low Priority – Use lower lab detection limits for selenium and dissolved metals.	

WET BEAVER CREEK	USE SUPPORT	OVERALL ASSESSMENT	
From Rarick Creek to Dry Beaver Creek 15060202 – 003 6.6 Miles	A&Wc – Inconclusive FBC – Inconclusive FC – Inconclusive AgI – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 11/26/2002 – 09/05/2003		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
In Montezuma Castle National Monument VRWBV006.50 101543	USGS Ambient	3 dissolved metal samples: Antimony, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, nickel, silver, uranium, zinc. (No total metals samples)	3 samples: Dissolved oxygen, pH, total phosphorus	3 Suspended sediment 3 Total dissolved solids

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient nitrogen, phosphorus, *E. coli* bacteria, boron, copper, lead, manganese, and mercury to assess A&W, FC, FBC, AgI and AgL		
MONITORING RECOMMENDATIONS		Low Priority – Collect core parameters to represent at least three seasons during an assessment period.	

WHITEHORSE LAKE 15060202 – 1630 40 Acres	USE SUPPORT		OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A D E Q	A&Wc – Inconclusive FBC – Inconclusive FC – Attaining DWS – Attaining AgI – Attaining AgL – Attaining	Category 2 Attaining some uses		
	E P A	A&Wc – Impaired	Category 5 Impaired		EPA listed in 2004 due to low dissolved oxygen. (See discussion below)

Light blue highlights indicate EPA impairments based on EPA assessment and listing criteria. This listing may change when EPA reviews and approves the 2006/2008 impaired waters list. Such listings do not satisfy requirements established in ADEQ's Impaired Water Identification Rule; therefore, they are not included in the list of ADEQ's Impaired waters (Appendix B and Appendix C).

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 07/26/2000 – 03/18/2002		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Dam VRWHH-A 100090	ADEQ Ambient	10-11 total and 1 dissolved metals samples: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, nickel, selenium, silver, zinc 4 total metals only: Mercury	10-11 samples: Ammonia, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen, total phosphorus, dissolved oxygen, and pH	2 *E. coli* bacteria 10 Fluoride 9 Total dissolved solids
At boat ramp VRWHH-BR 101317	AGFD & AGFD Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USE	DATES – EXCEEDANCE	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	7 mg/L A&Ww	07/26/2000 – 4.7 mg/L	Attaining – Dissolved oxygen was below standards in only 1 of 11 sampling events. (Binomial) No indication of impairment. Remove from 303(d) List.
Nickel (total)	140 mg/L DWS	03/28/2001 – 210 µg/L	Attaining – Only one of eleven samples exceeded the standard. (Binomial)

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient dissolved metals (cadmium, copper, zinc) and *E. coli* bacteria to assess A&W and FBC.		Lab detection limits for selenium and dissolved metals (cadmium, copper, lead, mercury) were higher than A&W chronic criteria for at least 1 sample.
DISCUSSION OF DISSOLVED OXYGEN IMPAIRMENT		Evidence of potential impairment: Newer data does not show impairment as only 1 low dissolved oxygen measurement in the top meter in 11 samples. (Original listing was based on 5 of 10 samples not meeting DO standards.)	
MONITORING RECOMMENDATIONS		Low Priority – Collect missing core parameters to represent at least 3 seasons during the assessment period. Use lower lab detection limits for dissolved metals and selenium.	

WILLOW CREEK RESERVOIR 15060202 – 1660 295 Acres	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Inconclusive FBC – Inconclusive FC – Inconclusive AgI – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATES: 02/11/2004, 06/22/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Dam VRWIC-A 101922	ADEQ Ambient	2 total and 2 dissolved metals samples: Cadmium, chromium, copper, lead, nickel, silver, zinc 2 total only metals: Antimony, arsenic, barium, beryllium, boron, manganese, mercury, selenium, thallium	2 samples: Ammonia, total nitrogen, nitrite/nitrate, and total Kjeldahl nitrogen, total phosphorus, dissolved oxygen, and pH	3 *E. coli* bacteria 2 Fluoride 2 Total dissolved solids

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USE	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
pH	<9.0 SU A&Wc, FBC, DWS, AgI, AgL	06/22/2004 – 9.5 SU	Only 1 exceedance in 2 samples. Need more monitoring data to assess.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample (see assessment methods).

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
pH	Insufficient core parameters	Insufficient sampling events	
MONITORING RECOMMENDATIONS		Medium Priority – Collect additional pH measurements due to an exceedance. Elevated pH may be a symptom of excess nutrient loading. New methods for implementing the narrative nutrient standard should be applied to this lake once adopted, to determine whether narrative nutrient violations are occurring. Collect core parameters to represent at least three seasons during the assessment period.	

CHAPTER III
SUMMARY INFORMATION

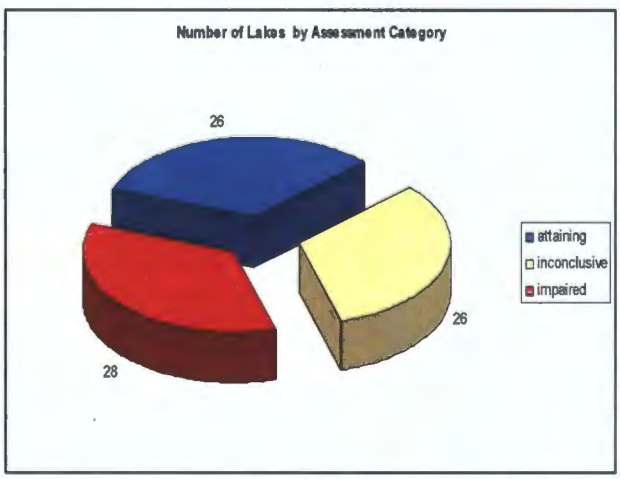
This chapter provides a summary of assessed surface waters. Progress and comparisons with previous assessments are illustrated in the following chapter. Statewide summary statistics can provide a general sense of the status of water quality in Arizona.

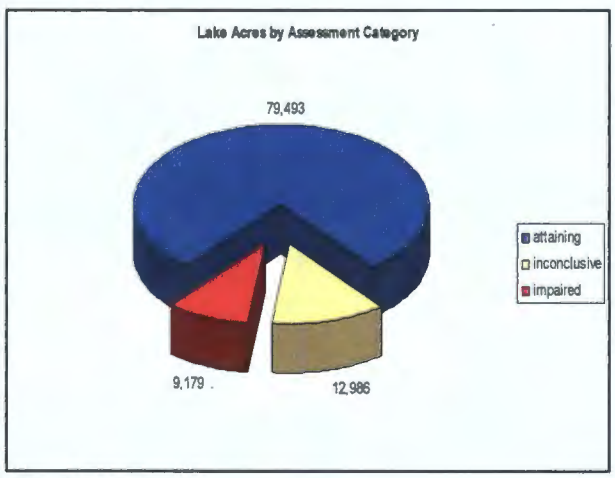
The assessments and statistics in this chapter exclude surface waters on tribal lands. Also, the statistics *include* waters that EPA listed in previous assessment.

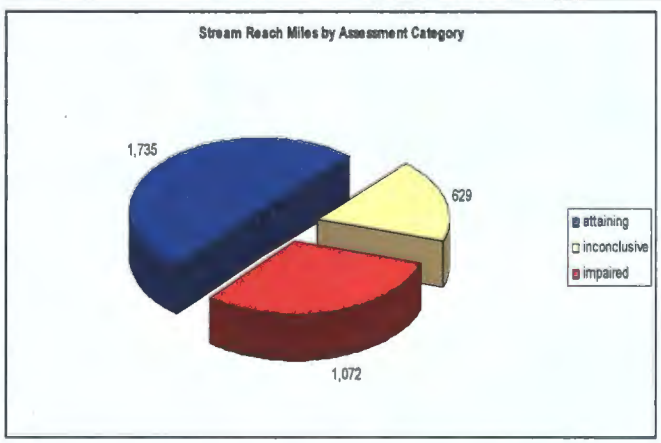
Attaining or Impaired Waters

Assessed Waters 2006/2008

USE SUPPORT CATEGORY	LAKES (Acres)	STREAMS (Miles)
Attaining Uses (Category 1 and 2)	79,493	1,735
Impaired (Category 4 and 5)	9,179	1072
Inconclusive (Category 3)	12,986	629
Total Assessed	**101,658**	**3,435**
Total Assessed as Attaining or Impaired (excluding Category 3)	88,672	2,806







About 78% of the lake acres and 50% of the stream miles assessed are attaining their uses.

If sites had been randomly selected across the state, this could be used to infer water quality throughout Arizona. However, sites are <u>not</u> randomly selected. They were selected by different programs and agencies for a variety of purposes, some with a bias towards finding pristine or impaired conditions. Therefore, inferences about water quality in general in Arizona should be limited. (See future monitoring discussion in Chapter IV.)

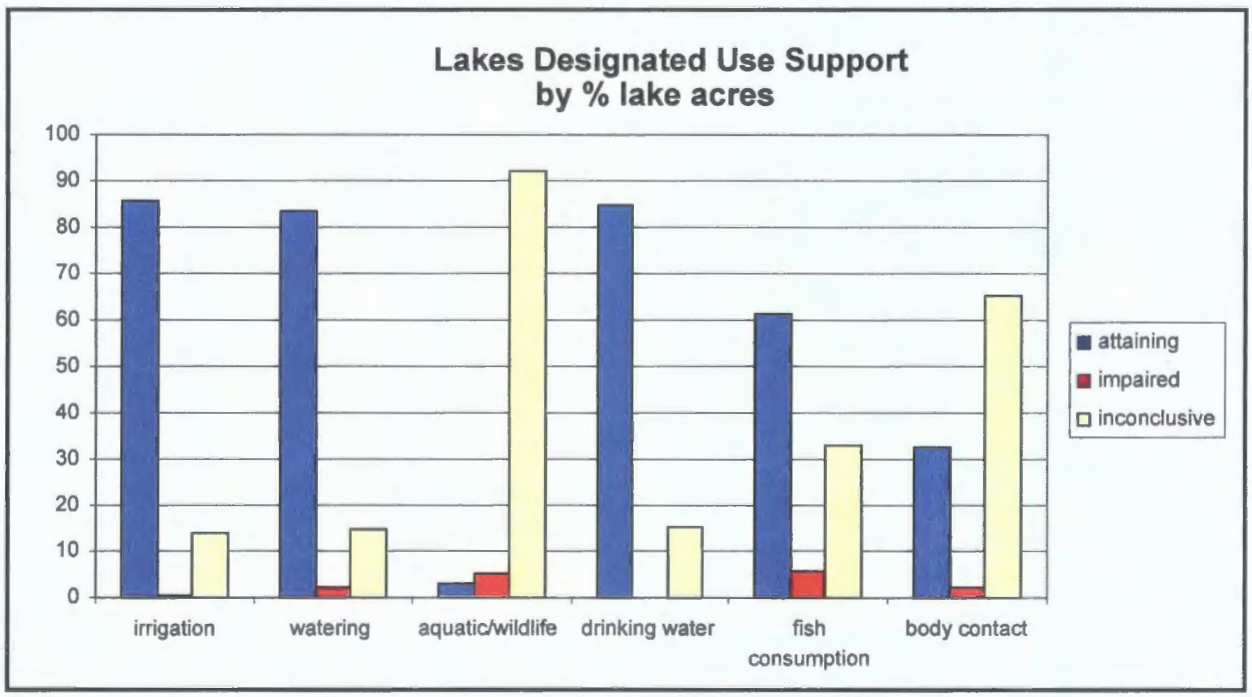
Designated Use Support – Narrative and numeric criteria were developed to protect uses shown to be occurring on a surface water – aquatic life, swimming, fishing, drinking water supply – therefore, designated use support should indicate whether our water is safe for use. (See explanation of standards and designated uses in the Assessment Methods document.)

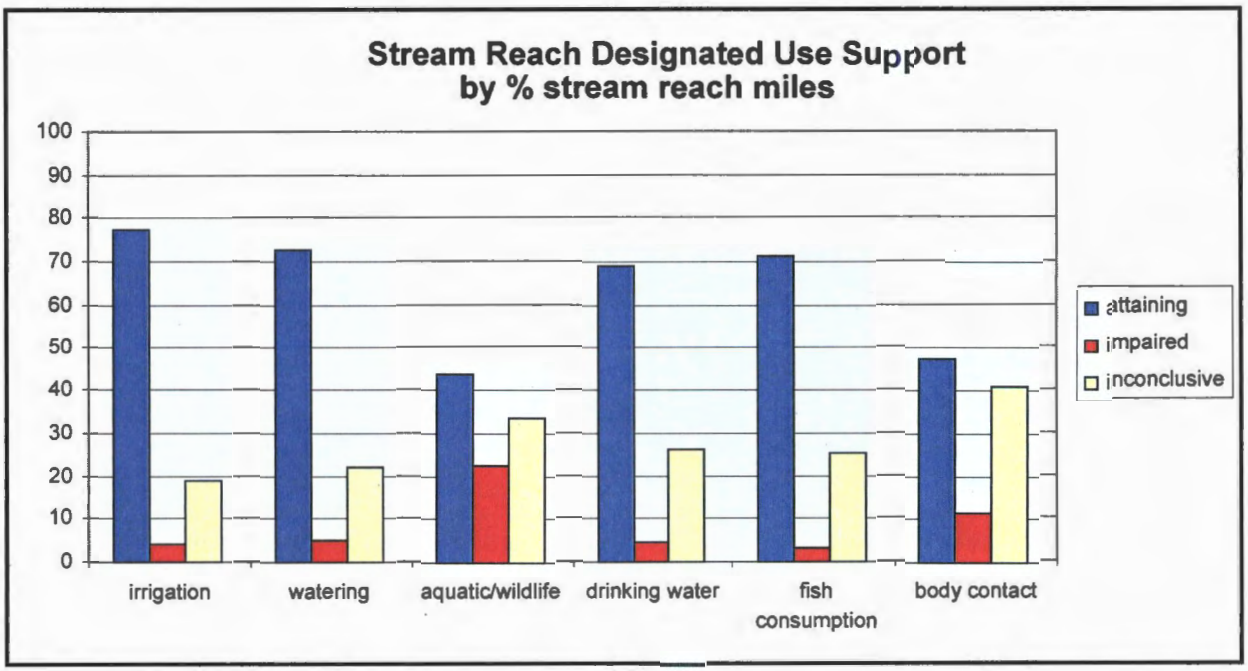
The following table and graph illustrate the relative use support for each of the designated uses.

Designated Use Support Statistics – 2006/2008

SUPPORT TYPE	LAKES			STREAMS		
	Attaining (acres)	Impaired (acres)	Total (acres)	Attaining (miles)	Impaired (miles)	Total (miles)
Aquatic and Wildlife	3,024	5,152	101,658	1,491	765	3,406
Fish Consumption	62,417	5,626	101,658	2,316	100	3,236
Body Contact	33,250	2,040	101,658	1,616	393	3,406
Dom. Water Source	60,214	0	71,112	388	26	562
Irrigation	82,949	417	96,990	1,403	72	1,815
Livestock Watering	83,891	2,004	100,542	2,122	150	2,918

**Total* miles and acres include miles and acres assessed as "inconclusive."





These statistics can be used to answer the following questions:

- **Is it Safe for Aquatic and Wildlife Uses?** – Aquatic life is most at risk due to degraded water quality, as the fish and other aquatic critters are living in the water. This is reflected in surface water quality criteria, as water quality criteria are frequently more protective (lower criteria were established) than even human health criteria. In this assessment, therefore, the aquatic life use has the lowest percentage of attainment and the highest percentage of impairment. This indicates that protection of aquatic life is generally fair in the waters assessed as 11% of the lakes and 40% of the streams are attaining this use. However, these water quality criteria are the most likely to be exceeded and result in impairment -- 5% of the lakes and 22% of the streams.

  Several large reservoirs were assessed as inconclusive when it came to this use, resulting in an unusually low proportion of attaining and impaired lake acres. These reservoirs, Lake Mohave, Lake Powell, Lake Havasu, and Roosevelt Lake, account for nearly 80% of assessed lake acres.
  Lakes Mohave and Havasu in the Colorado-Lower Gila watershed were inconclusive due to selenium concerns, while Lake Powell in the Colorado-Grand Canyon lacked core parameter monitoring. Roosevelt Lake in the Salt watershed lacked core nutrient parameters. More monitoring is planned for all of these reservoirs, and new narrative nutrient implementation guidance will be applied to the Salt River reservoirs by the next assessment.

  When it comes to streams, the primary cause of impairment was selenium, which can be found in local bedrock at natural high levels in some areas of the state. More studies will be done in association with TMDL development to determine whether or not the loadings are natural.

- **Is it Safe to Swim in the Water?** – Full Body Contact (swimming) or Partial Body Contact (wading) was shown to be attaining in 28.6% of the lakes and 46.0% of the streams assessed. The cause of impairment for this use in 10.9% lakes and 50.7% of streams is due primarily to *Escherichia coli* bacteria contamination.

  Studies suggest that swimming should be avoided during storm water runoff and in stagnant water where bacteria contamination is likely. Waters classified as "effluent dependent waters" and many shallow urban

lakes are also not designated for swimming or even wading.

Routine bacteria monitoring occurs at a few frequently visited swimming areas:

- Slide Rock State Park on Oak Creek,
- Beaches along Lake Havasu,
- Beaches along Lake Powell, and
- The Salt River Recreation Area (for part of this assessment period).

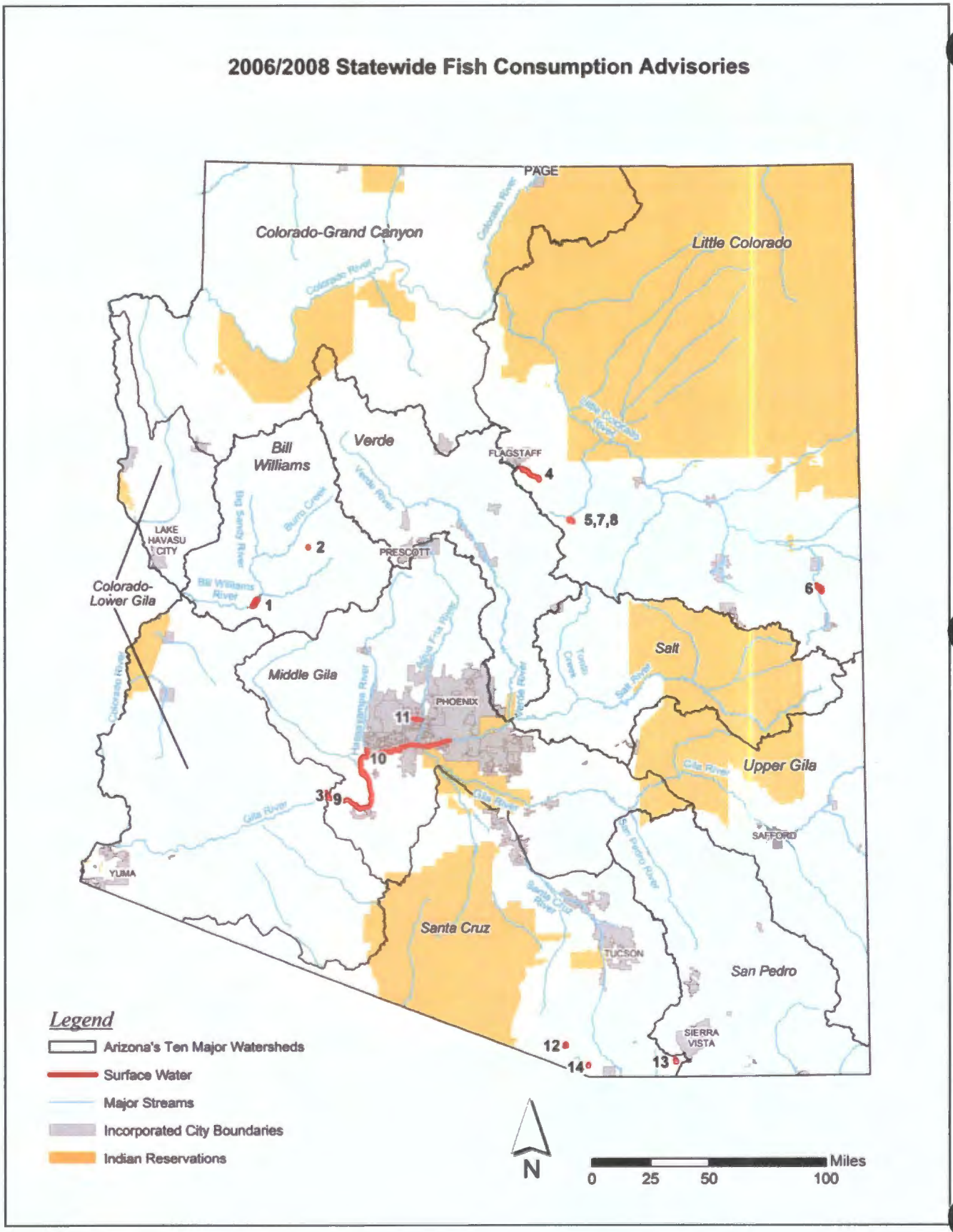
Of these monitored beaches, only Slide Rock state Park closed for swimming during the assessment period due to bacterial contamination. Slide Rock closes its swimming area when sampling results exceed water quality standards and the area remains closed until standards are met. (See TMDL discussion in the Verde Watershed.)

- **Should We Eat The Fish?** – Fish consumption advisories have been issued in 14 areas (see table below). These advisories are issued to inform the public about possible adverse health effects and they contain recommendations for how many fish meals can safely be consumed. Advisories may be directed at a specific subset of the population because some people are at greater risk (pregnant women and children). Additional information about fish tissue screening and fish advisories can be obtained by contacting ADEQ at (602) 771-4536 or Arizona Game and Fish Department at (602) 789-3260.

Fish Consumption Advisories (2006/2008)

SURFACE WATER	SIZE	POLLUTANT AND PROBABLE SOURCES	ADVISORY AND DATE ISSUED
Bill Williams Watershed			
1. **Alamo Lake**	1414 acres	Mercury. Mining and atmospheric deposition	2004. Meal = up to 8 ounces of largemouth bass or black crappie • Children under age 6: no consumption • Women of childbearing age: 1 meal/month • Women not childbearing age: 5 meals/month • Adult men: 6 meals/month
2. **Coors Lake**	229 acres	Mercury. Mining and atmospheric deposition.	2004. Meal = up to 8 ounces of largemouth bass or black crappie • Children under age 6: no consumption • Women of childbearing age: 1 meal/month • Women not childbearing age: 5 meals/month • Adult men: 6 meals per month
Colorado – Lower Gila Watershed			
3. **Painted Rock Borrow Pit Lake**	185 acres	DDT metabolites, toxaphene, and chlordane from historic pesticide application on agricultural lands.	1991. Do not consume fish and other aquatic organisms
Little Colorado Watershed			
4. **Lake Mary, Upper & Lower**	1625 acres	Mercury. Atmospheric deposition	2002 Do not consume walleye fish and limit consumption of other fish to one 8-ounce fillet per month.
5. **Long Lake**	594 acres	Mercury. Atmospheric deposition	2003. Do not consume fish.
6. **Lyman Lake**	1500 acres	Mercury. Atmospheric deposition.	2004. Meal = up to 8 ounces fish • Children under age 6: no consumption • Women of childbearing age and children under age of 16: 1 meal/month • Women not childbearing age: Consult health care provider • Adult men: 5 meals/month
7. **Soldiers Lake**	28 acres	Mercury. Atmospheric deposition	2003 Do not consume fish
8. **Soldiers Annex Lake**	122 acres	Mercury. Atmospheric deposition	2003. Do not consume fish.
Middle Gila Watershed			
9. **Painted Rocks Reservoir**	100 acres	DDT metabolites, toxaphene, chlordane from historic pesticide application on crops	1991. Do not consume fish and other aquatic organisms
10. **Portions of the Gila, Salt, and Hassayampa rivers**	140 miles	DDT metabolites, toxaphene, chlordane from historic pesticide application on crops.	1991. Do not consume fish and other aquatic organisms
11. **Dysart Drain (drains to Agua Fria River in Phoenix metropolitan area)**	3 miles	DDT metabolites. From historic pesticide application on crops.	1995 Do not consume fish or other aquatic organisms.
Santa Cruz Watershed			
12. **Arivaca Lake**	120 acres	Mercury. Mine tailings and atmospheric deposition	1996. Do not consume fish or other aquatic organisms.
13. **Parker Canyon Lake**	130 acres	Mercury. Sources to be investigated.	2002 • Women of childbearing age and children under 16: no consumption • Women not of childbearing age: Consult health care provider. • Adult men (above 15): Up to five 8-ounce meals/month.
14. **Pena Blanca Lake**	50 acres	Mercury. Sources historic mining and atmospheric deposition	1995 Do not consume fish or other aquatic organisms.

2006/2008 Statewide Fish Consumption Advisories



A national fish consumption advisory has also been issued by EPA. This advisory recommends that pregnant women (or who may become pregnant), nursing mothers, and young children should limit fish consumption. The women should limit fish to one six-ounce meal per week (8 ounces uncooked fish) and the young children to one two-ounce meal per week. (See further discussion of mercury later in this chapter.)

- **Can We Drink the Water?** – Of the waters assessed, only 0.04% of the lakes and 4.61% of streams were impaired and 83.2% of the lakes and 69.2% of the streams were attaining this use. Keep in mind that these samples were of the source water (the raw water) and do not reflect the quality of water being provided at the tap to the customer. At a minimum, surface water must be disinfected and filtered before it is used for drinking.

  The quality of water delivered by public water systems is strictly regulated and monitored to ensure that federal and state standards established to protect public health are met. Drinking water advisories are issued by the supplier when monitoring confirms that a drinking water standard has been exceeded. Contact the supplier to request a consumer confidence report to learn more about the quality of your public drinking water system.

  When water is supplied by a private water system (a system serving fewer than 15 connections and 25 people), it is the user's responsibility to test and protect the quality of their drinking water. General water quality information and ways to protect drinking water sources can be obtained by contacting a county health department.

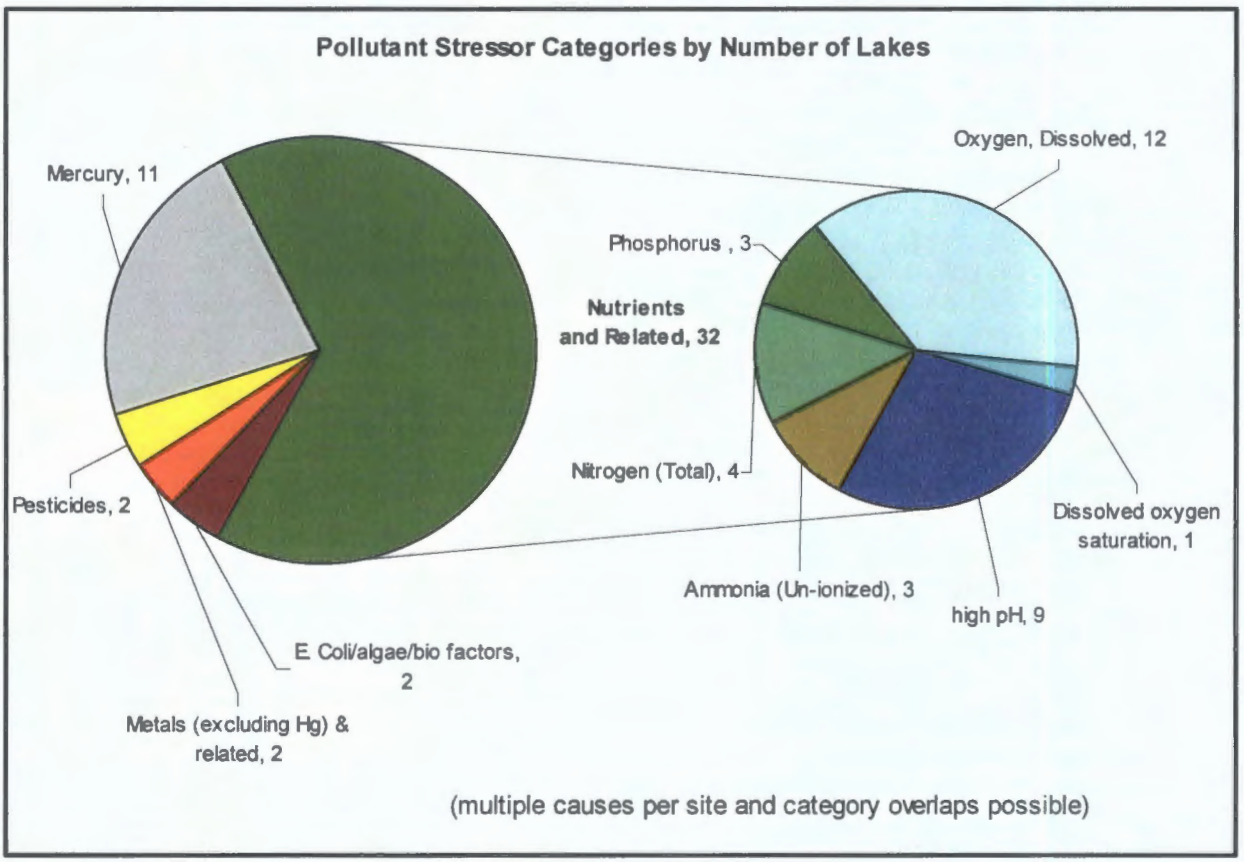
  Never drink untreated lake or stream water. At a minimum, back packers must filter and disinfect the water before drinking it.

Pollutants Causing Impairments and Probable Sources – The pollutants causing impairments are summarized in the following table and graphs.

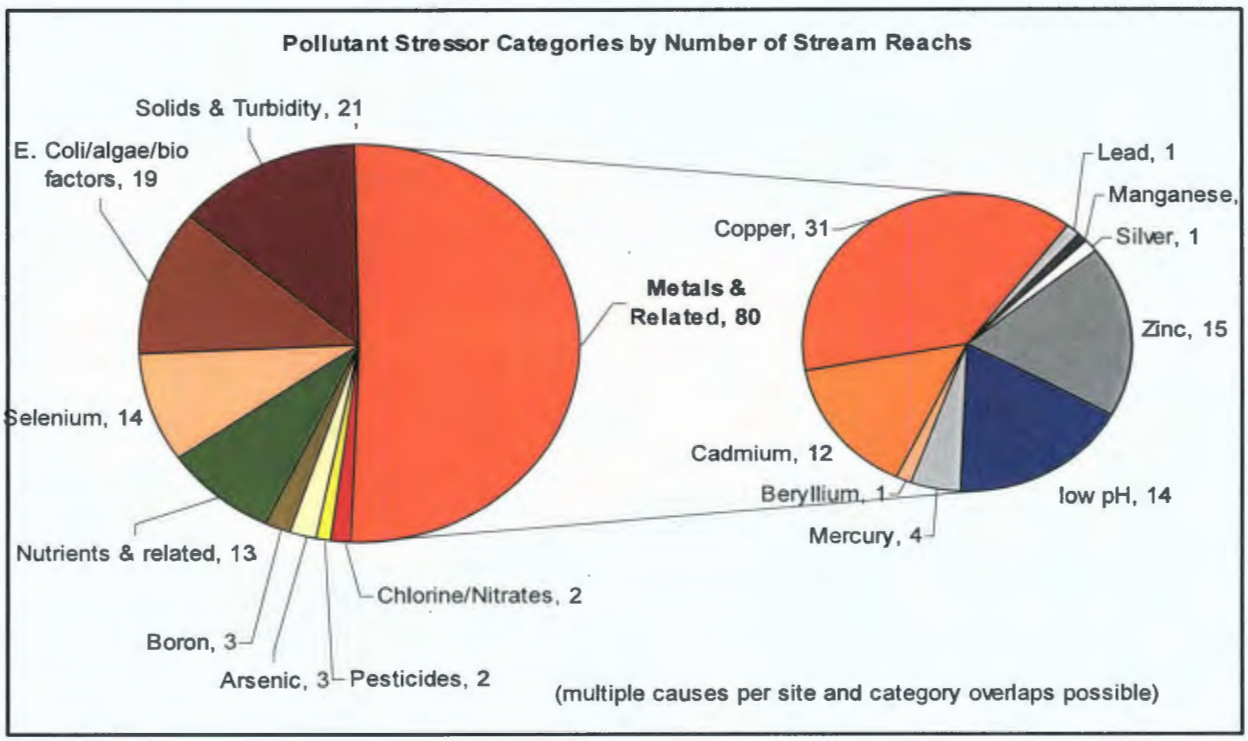
Pollutants or Stressors Causing Impairments in 2006/2008

POLLUTANT STRESSOR CATEGORY	LAKES (acres)	STREAMS (miles)
Nutrients (nitrogen, phosphorus, high pH, dissolved oxygen, or ammonia)	9,190	230
Metals (cadmium, chromium, copper, lead, silver, zinc or low pH) (Excluding mercury, boron, selenium)	62	410
Selenium	0	271
Mercury	5,341	40
Boron	0	59
Suspended sediment, turbidity, or sedimentation	0	288
E. coli bacteria	12	232
Pesticide (DDT metabolites, chlordane,toxaphene)	285	99
Other (Nitrate from explosives and chlorine)	0	22

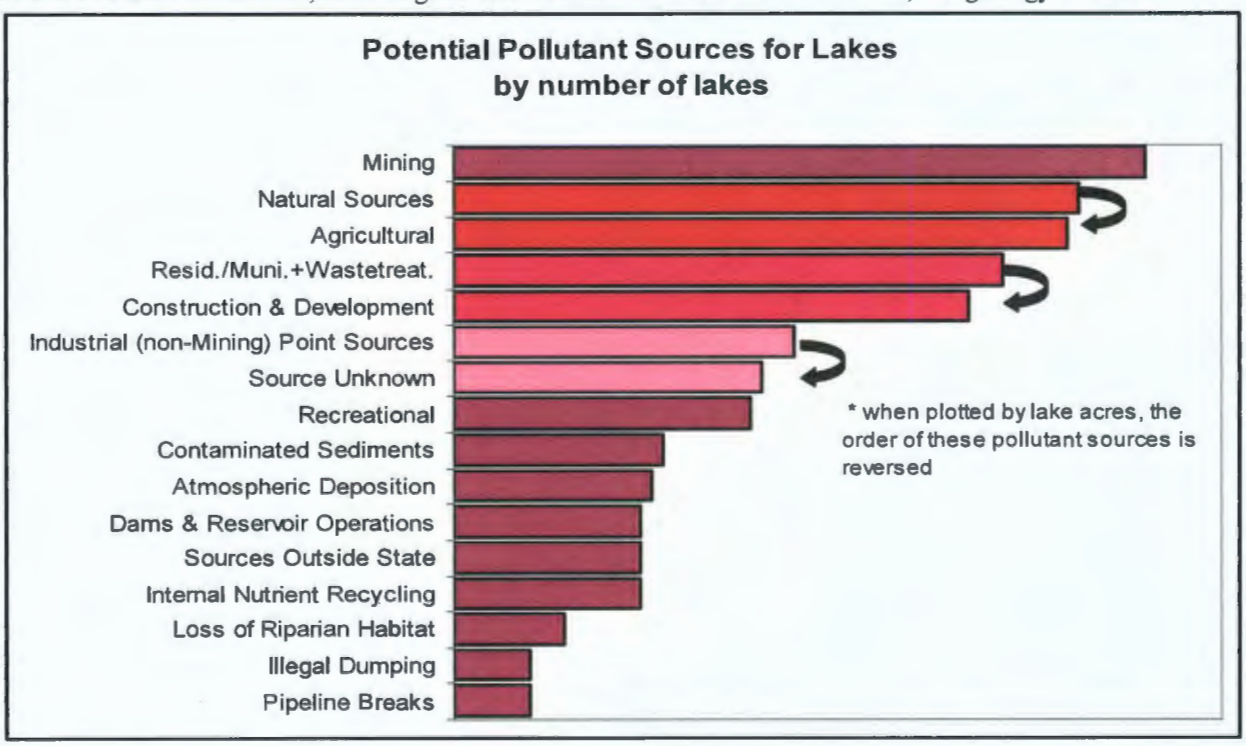
*Cannot total miles or acres because some waters are impaired by multiple stressors

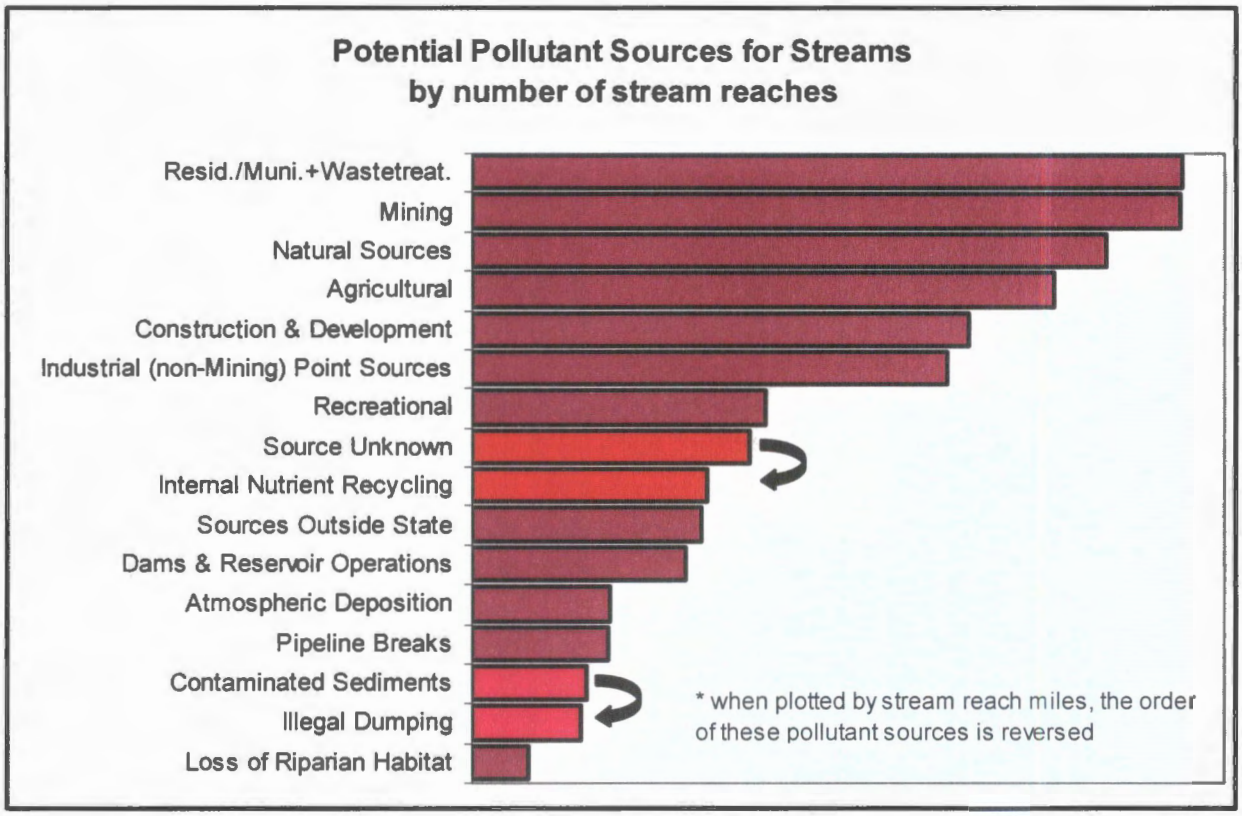


*A high percentage of Arizona's lakes are stressed by nutrient pollutants. The primary cause of impairment for lakes is high pH and the natural alkalinity of Arizona's surface waters may be contributing to this cause.



Based on past investigations, the probable sources contributing significant loadings are shown in the following tables and graphs. More than one source may be impacting a given stream reach or lake. These statistics are based on best available information, knowledge of land uses and activities in the watershed, and geology of the watershed.





Nutrient-related Impairments and Sources

Low dissolved oxygen and high pH are generally related to nutrient enrichment problems in lakes. Excess nutrients (nitrogen and phosphorus) can result in eutrophic or even hyper-eutrophic conditions, with high concentrations of algae and aquatic weeds during highly productive summer days. These conditions negatively impact recreational activities such as swimming and boating. If the algae suddenly die off, the resulting dissolved oxygen sag and high pH can result in fish kills. Excess algal growth can also impair public water supplies by imparting taste and odor problems, or by resulting in high concentrations of algal toxins.

Recent TMDL investigations have shown that the primary sources of nutrients affecting lakes and streams in Arizona are:

- Inadequate septic systems
- Inadequate toilet and waste disposal facilities in recreational areas
- Attached to sediments being transported in from the watershed (from grazing, wildlife, urban development, irrigated crop production)
- Animal wastes near the surface water (dog droppings, geese and ducks).

The potential for excess nutrient problems is further exacerbated by natural conditions, such as sunny days and hot temperatures that increase algae and aquatic plant production, nutrient cycling in the lake, and even shallow lake design and maintenance.

Pathogen-related Impairments and Potential Sources

ADEQ uses *Escherichia coli* (*E. coli*) bacteria as an indicator of pathogens in the water. While pathogens occur naturally in the environment, high concentrations of *E. coli* in waters used for swimming or even wading can pose a threat to human heath.

Pathogens are frequently attached to sediment; therefore, water with heavy sediment loads is likely to have high levels of pathogens. Flood waters carry pathogens into our surface waters at high concentrations; therefore, swimming should be curtailed during runoff events. Murky, sediment loaded water, is also difficult to effectively

disinfect for drinking water purposes. This can be a problem for public systems using surface waters or for backpackers who need to filter and disinfect the water for drinking purposes.

The sources of *Escherichia coli* and other pathogens are generally the same as the sources of nutrients discussed above: inadequate septic systems, inadequate toilet and waste disposal facilities at recreational areas, sediments, animal wastes attributed to grazing, dog droppings, ducks and other animals being fed at lakes. Watershed control strategies frequently focus on restoring natural vegetation filters, reducing erosion and sedimentation, improving waste management, and improving septic systems.

Big Sandy River Storm Flow

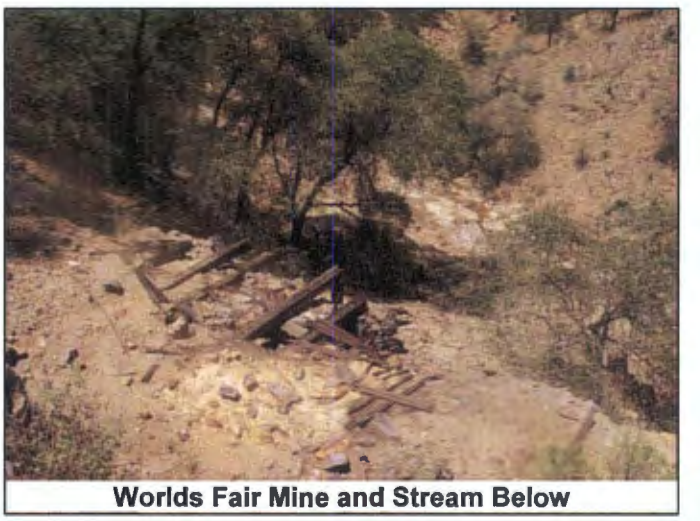
Sediment-related Impairments and Potential Sources

Arizona adopted a suspended sediment concentration (SSC) standard in 2002 to replace its turbidity standard. The SSC criterion is intended to protect fish coldwater and warmwater aquatic communities in perennial streams. Because sediments also contain the other pollutants of concern (metals, nutrients, bacteria), reducing suspended sediment loadings is a priority.

Although some suspended sediment will occur naturally, SSC and sedimentation can be reduced by stabilizing stream banks, reducing and directing storm runoff flow, and improving the riparian conditions or constructing other vegetative filters. Watershed management strategies are being implemented in Arizona to reduce sediment loadings from construction sites, grazing, silviculture, urban development, crop production, mining, recreation (off-highway vehicles), and more.

Metals-related Impairments and Potential Sources

High concentrations of metals, especially dissolved metals, primarily pose a risk to aquatic life because even low concentrations can be toxic to critters that live in the water. Metal pollutants can impair each one of our designated uses if at a high enough concentration.



Worlds Fair Mine and Stream Below

Arizona has extensive areas of mineralized rock, and therefore, a high potential for metals pollution. Metals leach more readily from soil or mineralized rock that has been exposed by mining or even road building and land development activities. Ore bodies and springs that recharge our streams can also naturally contribute metals to our streams.

Acidic conditions occur near mining activities. The lower the pH of the water (more acidic), the more likely metals will be in their more toxic dissolved state. The more neutral or alkaline the water conditions, the more metals adhere to sediment and are less toxic. Fortunately, most of Arizona's lakes and streams are relatively alkaline. When metal-contaminated sediment is transported downstream to a lake, the water slows and the sediments drop to the bottom of the lake, where the contamination becomes buried under layers of sediment. Therefore, most metal exceedances occur near mines and seldom occur in lakes.

Mercury and selenium have a different fate and transport, so they are discussed separately.

Mercury Impairments and Potential Sources

Mercury bioaccumulates in the food chain, with top predator fish having higher mercury concentrations than forage fish. Mercury poses a serious health concern to humans and other animals that prey on fish contaminated with mercury. When the mercury concentration in the edible portion of a fish exceeds 0.3 mg/kg, ADEQ establishes a Fish Consumption Advisory for the lake, in conjunction with the Arizona Department of Health Services and the Arizona Game and Fish Department. These advisories have been issued at a number of lakes in Arizona.

Mercury is naturally present in rock formations in Arizona. If not stabilized, crushed rock mine tailings piles can erode and add mercury and other metals into the surface water. Such abandoned and inactive mine tailings piles are scattered across Arizona. Also, mercury was used in the gold mining process before the introduction of cyanidation technology at the beginning of the 20th Century. In this process mercury was used to amalgamate with the mercury. Then the mercury was evaporated off in a furnace. Some mercury loss occurred in the many steps in this process.

Significant potential point sources of airborne mercury have been shown to be the source of mercury across the United States (*Mercury Study Report to Congress*, EPA, 1997). These sources include coal-fired power plants, waste incinerators, cement and lime kilns, smelters, pulp and paper mills, and chlor-alkali factories. ADEQ is currently developing a number of mercury TMDLs for lakes and is collecting data to quantify the mercury contribution from atmospheric deposition.

Selenium Impairments and Potential Sources

Selenium bioaccumulates and can cause reproductive effects to fish and waterfowl. Selenium is a naturally occurring metalloid. It has a complex biogeochemistry in the aquatic environment as it can exist in and transform between several oxidation states, each with varying bioavailability and toxicity. It also has a very narrow concentration range between nutritional requirements and toxicity. Therefore, assessing the risk posed by selenium exceeding chronic criteria requires extensive site-specific studies, with the primary focus on documenting reproductive effects to exposed fish and waterfowl.

Anthropogenic sources of selenium in Arizona may include: irrigated agriculture return flows and drainage, combustion of fossil fuels, coal mining, sulphide ore mining (copper, lead, zinc mines) and animal feed supplements.

Pesticide-related Impairments and Potential Sources

The historic use of banned pesticides is still the primary source of pesticide contamination problems in Arizona. Banned pesticides such as DDT take a long time to degrade. Meanwhile, relatively small concentrations can bioaccumulate in the food chain, passing higher concentrations on to offspring and predators, including humans. The presence of pesticides in fish tissue has lead fish consumption advisories being posted for the Gila River, Salt River, and Hassayampa River below the Phoenix Metropolitan area down to Painted Rocks Dam. These pesticides were used on cotton and citrus fields and are transported into our streams and lakes attached to sediments from the historic crop land.

Comparison of Point Source and Nonpoint Sources of Pollutants -- Water pollution is often discussed in terms of "point" and "nonpoint" sources. Thirty years ago, federal and state regulations primarily governed point source discharges through the National Pollution Discharge Elimination System (NPDES) permit requirements. Point sources come from a discrete discharge point or pipe (e.g., a wastewater treatment plant discharge). However, pollution also comes from more diffuse sources that are referred to as "nonpoint sources," such as runoff from urban areas, farm fields, or mining operations.

Potential for Nonpoint Source Pollution

Differentiating between point and nonpoint sources is not

always clear. For example, are septic systems or stormwater runoff from mine tailings, construction sites, urban areas, or concentrated animal feeding operations considered point sources or nonpoint sources? All of these require permits. The stormwater runoff examples require an NPDES general permit. However, reductions in stormwater loadings are handled by application of nonpoint source management practices. For this assessment, these sources were differentiated as follows:

- Septic systems were considered nonpoint sources.
- Stormwater runoff from constructions sites was considered nonpoint sources.
- Stormwater runoff from urban areas was considered nonpoint sources.
- Stormwater runoff from concentrated animal feeding operations was considered a nonpoint source.
- Active mine sites that are required to obtain a general NPDES permit were considered point sources, while inactive or historic mine sites were considered nonpoint sources. For this assessment, only historic mine tailings were considered sources of impairments.

Estimated Contributions from Point and Nonpoint Sources – 2006/2008

	Point Source	Nonpoint Source
Streams (miles)	46	3,245
Lakes (acres)	520	30,504

*Miles include intermittent and ephemeral streams, canals, and washes.

Most pollution in Arizona's surface waters is contributed by nonpoint or diffuse sources of pollution. This may indicate the effectiveness of the state and federal regulatory programs working with point source discharges. The control of nonpoint source contributions largely remains non-regulatory, based on education and funding of mitigation projects.

CHAPTER IV
ACTION PLAN

How do we get from assessments to water quality improvements? This chapter will discuss programs involved in mitigating water pollution problems. It will also discuss water quality research, including research into new standards, monitoring, and assessment techniques.

Impaired Waters → Now What

Monitoring and assessments are part of a process to identify impaired waters and then reduce discharges of pollutants in the watershed. Surface waters in **Appendix B** categories 4 and 5 are not attaining or impaired for their designated uses. Impaired waters that require a Total Maximum Daily Load Analysis (on the 303(d) List) are in Category 5. Waters that are not attaining a use and do not require a TMDL (at this time) are in Category 4. For example, once the TMDL is completed, the surface water is moved to Category 4A. Surface waters that are not attaining standards solely due to natural conditions are in Category 4N. If actions are being taken so that surface water standards will be met, ADEQ and EPA may agree to place the surface water in Category 4B. (See the Assessment Methods document for further information).

It is important to recognize that all waters in Category 4 and 5, even waters that are solely impaired due to natural conditions, are protected under Arizona's Antidegradation Rule (Arizona Administrative Code R18-11-107), as a "Tier 1" waters. No further degradation by that pollutant is allowed. Potential pollutant loadings must be considered by ADEQ and several federal agencies before permits or certification are issues (e.g., NPDES/AZPDES discharge permits, grazing permits).

Total Maximum Daily Load Analyses – Usually, if an assessment unit is identified as impaired, a Total Maximum Daily Load (TMDL) must be developed. A TMDL is a written analysis that determines the maximum amount of a pollutant that a surface water can assimilate (the "load"), and still attain water quality standards during all conditions.

Sources of pollutants are identified in the initial phase of the TMDL. Pollutant loading can originate from two types of sources: point and nonpoint. Point sources are discrete conveyances of pollutants discharged directly to a surface water, such as wastewater treatment plant outfalls. Nonpoint sources are non-discrete discharges, including runoff generated by activities such as grazing, agriculture, mining and forestry.

Waste load reductions from point sources can be managed through permitting programs such as Arizona's Pollutant Discharge Elimination System. However, there are few regulatory actions available to control nonpoint pollution, so load reductions from these sources are primarily voluntary. Nonpoint source pollution may include excessive sediment caused by the denudation of grasslands, the location of roads, construction, bacteria from wildlife and/or recreation, metals from historic mining practices and road cuts through ore bodies, and pesticides from historic agricultural practices.

TMDL Schedule and Prioritization – A schedule for TMDL development is provided in **Appendix C.** Criteria for this ranking is established in the Impaired Waters Rule (R18-11-606) (see Assessment Methods document). In general, waters with "high priority" factors are scheduled to be initiated within two years following EPA's approval of the 303(d) List, as these have a substantial threat to health and safety to humans, aquatic life, or wildlife. However, some "low priority" factors actually take precedence over high priority factors when completing the TMDL at this time would either not be appropriate or an effective use of resources (e.g., standard change is proposed).

The published schedule may be revised due to changes in resources to complete TMDLs or new information obtained while developing the TMDL. Such changes are formally negotiated with EPA and would be made known to the public through the TMDL status page on ADEQ's website: www.azdeq.gov.
Currently TMDLs have been approved on least 38 assessment units since 1998.

TMDL Implementation Plans (TIPs) – After load allocations are established in the TMDL, strategies must be implemented in the watershed so that these allocations will be met in the future. Normally the TIP is included in the TMDL and it identifies generic strategies, agencies or groups who will be involved in implementation, a tentative schedule, and how effectiveness will be determined. The table in **Appendix F** also indicates the status of TMDL Implementation Plan development.

Landowners, governmental agencies, nonprofit organizations, and other stakeholders are actively encouraged by ADEQ to help develop these management strategies. Implementation of strategies or projects rely on the cooperation of stakeholders that live within the watershed or have management responsibilities for the lands and the surface and ground water resources within the watershed.

Implementation on Nutrioso Creek

To reduce nonpoint source pollution, ADEQ works with federal, state, and local agencies, tribes, nonprofit organizations, the environmental community, and local citizens to develop and implement watershed management strategies. ADEQ's Nonpoint Source Program aims to address water quality issues primarily through public education and involvement – development of a commitment to watershed stewardship.

The Nonpoint Source Control Program relies on this type of cooperation, education and partnership as the primary method to reduce nonpoint source pollution and improve the state's water quality.

Watershed Partnerships – Watershed protection groups (partnerships) were first organized in Arizona by the Department of Water Resources to address water quantity issues – limited water resources, high water demands, and water rights. ADEQ is now working with these groups, along with groups established during TMDL development, to address water quality issues. Active watershed partnerships and contact information is provided in the watershed discussions in Chapter II.

Water Quality Improvement Grants – These funds (Clean Water Act Section 319(h) Funds) implement on-the-ground water quality improvement projects that address nonpoint sources of pollution. ADEQ administers these grants. Watershed Protection Funds, administered by the Arizona Department of Water Resources, also fund projects that enhance or restore surface waters, associated riparian resources and wildlife habitat. Projects that received these funds since 2000 are described in the watershed reports in Chapter II. Projects designed to reduce loadings of pollutants causing impairment are given highest priority. As documented in the table in **Appendix F**, even before a TMDL can be developed, funds are often distributed to implement projects that will reduce pollutant loadings!

The Water Quality Improvement Grant Manual provides details about the grant process. A copy of the manual and other information about this program can be obtained by contacting the grant coordinator at (602) 771-4635 or toll free at (800) 234-5677 (extension 771-6535) of from the internet at www.azdeq.gov/environ/water/mgmt/planning. Information about the Arizona Water Protection Fund can be obtained by contacting the commission at (602) 417-2400 extension 7016.

Watershed Based Plans – Watershed plans are needed to properly allocate limited resources in mitigating water quality issues. Several watershed partnerships have developed such plans, identifying critical water quality problems in their areas. A good watershed plan includes the following elements:

Critical water quality issues, probable sources of pollutants, strategies to reduce or eliminate such problems – and who will take these actions, technical and financial assistance to implement actions, a schedule (milestones), and how effectiveness will be measured.

The Nonpoint Source Education for Municipal Officials (NEMO) Project, funded by EPA, has been working with ADEQ and the local watershed groups to develop watershed based plans. Their plans go even further by adding the following elements to these watershed plans:

Characterize the watershed,
Prioritize sub-watersheds according to risk.

Watershed plans developed by NEMO can be downloaded from their web site at: www.srnr.arizona.edu/nemo.

Master Watershed Steward Program – The mission of the Master Watershed Steward Program is to educate and train citizens across Arizona to serve as volunteers in the protection, restoration, monitoring, and conservation of their water and watersheds. This new program is a partnership of the University of Arizona Cooperative Extension and ADEQ. Classes are being taught across the state.

To become a Master Watershed Steward, participants attend the required 50 hours of course and field work and provide a minimum of 40 hours of volunteer service to their communities and watersheds. Stewards learn about:

- Watersheds and hydrology
- Local geology and soils
- Arizona climate
- Water quality and quantity issues
- Regional, state, and local water management
- Mapping and geospatial technology (GPS)
- Watershed fauna and flora
- How to work together

More information can be obtained from the Arizona Extension Service at their website: cals.arizona.edu/watershedsteward.

Volunteer Monitoring – Volunteer monitoring groups can monitor the condition of surface and ground water. Gateway Community College in Phoenix, in cooperation with ADEQ, has developed a one-credit course on water quality sampling to train Arizona's volunteers and provide further opportunities for watershed stewards. Information about these classes can be obtained at the college website:

Monitoring Nutrioso Creek

environment.gatewaycc.edu/resources/volunteermonitoring/default.htm.

Determining Water Quality Improvements – Once a TMDL has been developed, the surface water is removed from the 303(d) list, but usually the water is still impaired and simply moves from the Category 5 to the Category 4 list of impaired waters. To determine that a water is no longer impaired by a pollutant, ADEQ must do further monitoring. These new samples need to be collected during critical conditions – those environmental factors

(stream flow, season, runoff events, location, runoff events) during which an exceedances of a water quality standard or criterion is most likely based on past exceedances or modeling results. There may also be critical locations or sites where exceedances are most likely to occur. Critical conditions and locations are identified in **Appendix E**. This list is constantly being revised as new information is analyzed.

The number of samples required to establish that a surface water is no long impaired varies by type of pollutant, but the factors are specified in the Impaired Water Identification Rule (see draft 2006/2008Assessment Methods document). The delisting criteria vary depending on the criteria used during the listing.

This assessment showed that a number of pollutants could be removed from the impairment tables. A list of pollutants no longer impairing waters and waters that are no longer impaired is provided in **Appendix D**.

Potential Impacts on Permitted Discharges – Although assessments are not compliance based actions, once an assessment unit is identified as impaired, there are indirect consequences on dischargers or potential activities in the drainage area. For example, any entity seeking a permit for a new discharge or renewing an existing permitted discharge under the National (or Arizona) Pollutant Discharge Elimination System (NPDES/AZPDES) Program must demonstrate that it will not increase loadings for the parameter identified as causing the impairment. During the permit review cycle, additional monitoring may be required for the pollutant of concern. If discharge monitoring data or ambient in-stream monitoring data is available from a permitted facility, it may be used to model the discharge load during the TMDL. Such data can be used to accurately quantify the contribution from waste loads. After the TMDL is completed, ADEQ may renegotiate the permit discharge levels if the TMDL indicates that a waste load reduction is necessary. Discharge monitoring and ambient in-stream monitoring is invaluable in developing realistic discharge limitations.

Another example is that federally approved actions, such as grazing permits, may also be restricted when a stream is listed as impaired, if those actions would contribute pollutant loadings. ADEQ actively coordinates with the U.S. Forest Service and the Bureau of Land Management to identify strategies that would minimize load reductions especially to impaired waters.

Future Assessments and Monitoring

Assessments are based on standards and standards are based on scientific studies. New monitoring and assessment methods being developed are based primarily on regional studies. Arizona has taken the forefront in developing physical integrity and bioassessment methods appropriate for an arid region. Current monitoring and assessment methods are discussed in detail in the Assessment Methods document (draft 2006).

The following table indicates the existing basis of water quality assessments and the assessment tools being developed. Several rule revisions are being proposed during the current Triennial Review that will provide new tools for assessments.

Future Basis of Assessments

	AQUATIC AND WILDLIFE	HUMAN HEALTH			
		Body Contact	Fish Consumption	Water Source	Agriculture
BIOLOGICAL					
Escherichia coli (bacteria)		Existing			
Narrative nutrients (chlorophyll-a, algae, phytoplankton in lakes)	Proposed standards	Proposed standards	Proposed standards	Proposed standards	
Macroinvertebrate community	Proposed standards				
PHYSICAL/HABITAT					
Narrative bottom deposits	Proposed standards				
Suspended sediment concentration	**Existing and Proposed revisions**				
Stream channel stability	Developing standards				
CHEMICAL					
Water column chemicals (nutrients, metals, pesticides, VOCs, radiochemicals, etc)	**Existing**	**Existing**	**Existing**	**Existing**	**Existing**
Tissue samples			Developing standards		
Physical chemicals (pH, dissolved oxygen, temperature)	**Existing**	**Existing**	**Existing**	**Existing**	**Existing**
Narrative nutrients (DO, pH, ammonia in Lakes)	Proposed standards	Proposed standards		Proposed standards	
Narrative toxicity	Developing implementation procedures	Developing implementation procedures	Developing implementation procedures	Developing implementation procedures	
Contaminated sediment	Need to develop standards	Need to develop standards	Need to develop standards	Need to develop standards	Need to develop standards

Probability-based Monitoring in Streams – In 2006, ADEQ began using Regional Environmental Monitoring and Assessment Program (REMAP) methods developed by EPA to determine the status and regional-scale trends in water quality in streams. These methods use statistical-based site selection and an array of analytical tests and field measurements to estimate the current status, extent, changes, and trends in water quality on a regional basis. Using this method, sites would be selected randomly, so inferences can be made concerning regional water quality based on samples collected.

The following types of analytical tests and field measurements are used at each site to provide a broad assessment of condition and stressors:

- Water chemistry – To identify stressors (e.g., nutrient enrichment, metals) and classify water type
- Physical habitat – Degradation of riparian condition, channel stability, or stream bank stability acts to reduce the complexity and abundance of aquatic habitat and aquatic species.

- Benthic macroinvertebrate assemblage – Macroinvertebrates in streams reflect overall biological integrity. They also respond differently to stressors, so it may be possible to determine the type of pollutant causing the stress.

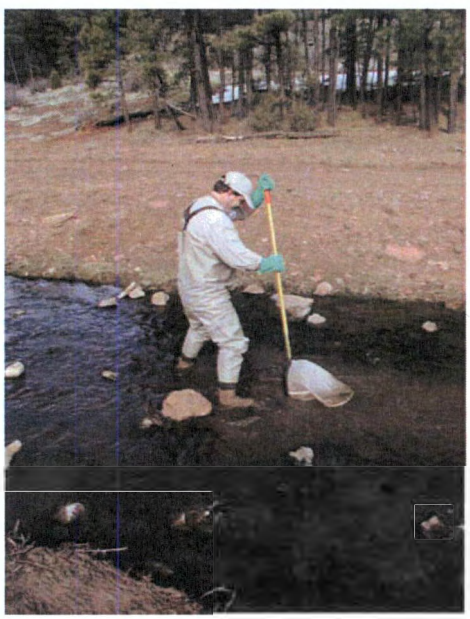
Where appropriate, fish tissue contaminants may also be collected to measure bioaccumulation of toxic chemicals in fish and indicates regional risks to humans and wildlife.

Biocriteria Development -- ADEQ has developed methods for assessing the biological integrity of perennial, wadeable streams in Arizona. Regional reference conditions were established and used to develop macroinvertebrate indexes of biological integrity.

Index of Biological Integrity

Biological integrity is the capability of maintaining a balanced, integrated, adaptive community of organisms. This community has a species composition, diversity, and functional organization comparable to that of the natural or least impacted habitat of the region. This least impacted diversity becomes the "reference conditions" used to measure and assess water quality.

The biological integrity of a stream reach can be determined by comparing its community characteristics to those of the reference community. Currently warmwater and coldwater community indexes have been established for perennial, wadeable streams.



The following reports have been produced by the Biocriteria Program and can be obtained by contacting ADEQ at (602) 207-4543 or on-line at the ADEQ website at www.azdeq.gov/environ/water/assessment/bio.html:

- ***Using Ecoregions for Explaining Macroinvertebrate Community Distribution Among Reference Stream Sites in Arizona***
  Patrice Spindler, ADEQ (1996)
  This study provides a classification system for warmwater and coldwater communities based on elevation to differentiate among aquatic communities in Arizona.

- ***Macroinvertebrate Community Distribution Among Reference Sites in Arizona***
  Patrice Spindler, ADEQ (2001)
  A "regional reference site" approach to bioassessments, based on warmwater communities below 5000 foot elevation and coldwater communities above 5000 feet.

- ***Biocriteria Program Quality Assurance Program Plan (QAPP)***
  Patrice Spindler, ADEQ (2006, in-press)
  Documents the bioassessment methods and protocols ADEQ is following. These methods need to be used when collecting samples in order to use the macroinvertebrate Index of Biological Integrity. Methods for measuring physical-habitat to support bioassessments are also included in this document.

- ***Development and Testing of a Biological Index for Warmwater Streams in Arizona***
  Gerritsen and Leppo, Tetra Tech Inc. (1998)
  This provides the statistical support for Arizona's warmwater macroinvertebrate Index of Biological Integrity -- perennial, wadeable streams below 5000 feet elevation.

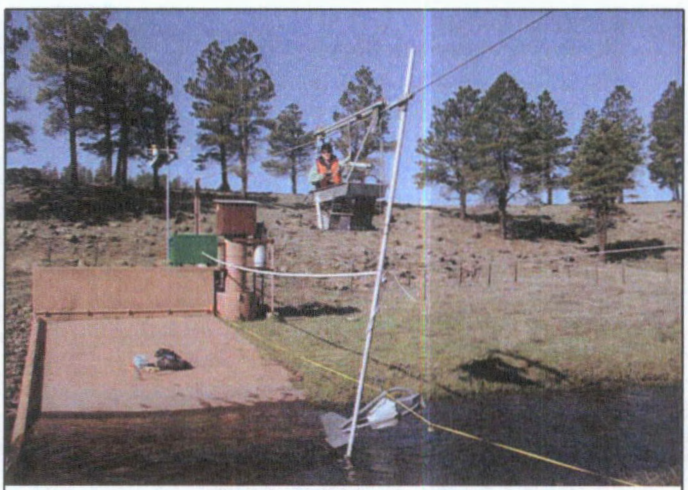
- ***Development and Testing for Biological Index for coldwater Streams in Arizona***
  Leppo and Gerritsen, Tetra Tech, Inc. (2000)
  This provides the statistical support for Arizona's coldwater macroinvertebrate Index of Biological Integrity – perennial, wadeable streams above 5000 feet elevation.

- ***Stream Channel Morphology and Benthic Macroinvertebrate Community Associations in the San Pedro River and Verde River basins of Arizona, 1999-2002***
  P. Spindler (2004)
  This study evaluated relationships between stream channel geomorphology measurements and the metrics that describe the macroinvertebrate community. The study found that the macroinvertebrate community responded to particle size changes and embeddedness of the substrate, with loss of taxa or shifts to more tolerant taxa at low levels of fines in the Verde and moderately high levels in the San Pedro River basin. Macroinvertebrate communities respond to sedimentation but the sensitivity may be different between hydro-physiographic provinces across Arizona.

- ***Narrative Biocriteria Standard Implementation Procedures for Wadeable, Perennial Streams***
  Patrice Spindler and Steve Pawlowski, ADEQ (Draft 2006)
  Documents ADEQ's approach to determining an exceedance of the narrative biocriteria standard for wadeable, perennial streams based on a warmwater and coldwater Indexes of Biological Integrity. ADEQ will use the 25th percentile of reference condition as the minimum threshold needed to attain the biocriteria standard. A verification sample will be required when the Index score falls between the 10th and 25th percentiles of reference conditions.

- ***Index of Biological Integrity Technical Support Documentation for the Narrative Biocriteria Standard***
  Patrice Spindler, ADEQ (Draft 2006)
  This document provides a detailed rationale for development and selection of metrics and thresholds for the Indexes of Biological Integrity.

Physical Integrity Criteria Development -- The physical integrity of a stream channel means that a dynamic equilibrium in stream channel stability is maintained over time. Rosgen (1996) provides a good definition of dynamic stability which can be defined as the ability of a stream to carry the water and sediment of its watershed while maintaining a stable dimension, pattern, and profile such that, over time, stream channel features are maintained and the stream system neither aggrades nor degrades. Dave Rosgen has developed a system for classifying streams into one of seven stream types and assessing stream channel stability, including bank stability. ADEQ is testing and calibrating Rosgen's channel stability assessment methods for use in evaluating physical integrity conditions in Arizona streams.



Bed Load Monitoring

These classification and assessment methods are being applied and tested in Arizona's streams and have lead to the following publications:

- ***Regional Relationships for Bankfull Stage in Natural Channels for Central and Southern Arizona***
  Moody and Odem (1999)
  Sites on perennial, intermittent, and ephemeral streams in central and southern Arizona were chosen to determine regional relationships of bankfull stage in natural channels. Watershed area and channel characteristics (width, depth, cross-section) were used to create "regional curves." These regional curves can then be used to identify bankfull in any other natural channel. Bankfull determinations are necessary for classifying streams according to Rosgen (1996).

- ***Integrating Regional Relationships for Bankfull Stage in Natural Channels of Arizona and New Mexico***
  Moody, Wirtanen, Knight, and Odem, Northern Arizona University (2000)
  This report integrates data from 139 study sites in Arizona and New Mexico to create regional curves for shared surface water drainages and ecoregions. These curves are the broad-scale regional curves that are currently used by ADEQ monitoring programs.

- ***Validating the Bank Erodibility Hazard Index in Central and Southern Arizona***
  Moody, Wirtanen, and Yard (2003)
  The purpose of this research document was to test and calibrate Rosgen's "Bank erodibility hazard index (BEHI)" for use in Arizona. This tool is an integral part of the Rosgen stream stability assessment method. The analysis found that the BEHI model produced reasonably accurate predictions of annual bank erosion when compared with measured erosion rates at more than 40 sites in the San Pedro and Verde River basins.

- ***Channel Stability Assessment of Biocriteria Sites in the Verde River Watershed***
  Moody, Wirtanen, and Yard (2003)
  This analysis documents the first application of the complete Rosgen stream channel stability assessment methodology to streams in Arizona. It provides physical integrity assessments for 10 sites in the Verde River Basin and recommendations for further research in calibrating the Rosgen method for Arizona.

- ***Lower Cienega Creek Restoration Evaluation Project: an Investigation into Developing Quantitative Methods for Assessing Stream Channel Physical Condition***
  Lin Lawson and Hans Huth, ADEQ (2003)
  This research effort evaluated a 10-mile reach of the Lower Cienega Creek basin for potential stream stabilization projects and developed quantitative techniques for assessing physical stream channel condition. Quantitative techniques used to evaluate sedimentation included the "Linear habitat complexity index" and "pool facet slope".

- ***Comparative Sediment Rating Curves for Two Gage Stations in the Upper Salt River Basin of Arizona***
  Patrice Spindler, ADEQ (2005), Wetlands VIII Grant from EPA
  This research effort evaluated whether sediment rating curves could be used to compare "reference" and study sites to set sediment load reduction targets in sediment impaired streams. However, during the study period, the flows for Beaver Creek (the impaired stream) were only 40% of flows in West Fork of Black River (reference stream), so less sediment transport occurred in Beaver Creek due to low flow. The study showed that sediment loads can be accurately and comprehensively estimated using remote automatic sampling of turbidity and flow data at gaging stations.

- ***Draft Fluvial Geomorphology Field Survey and Assessment Procedures***
  ADEQ (2004)
  Field methods for conducting stream surveys and Rosgen stability assessments are provided in this draft document.

- ***A Manual of Procedures for the Sampling of Surface Waters in Arizona***
  Lin Lawson (2005)
  Currently used field procedures for conducting water quality, biological and physical integrity/geomorphology/Rosgen surveys are provided in this new methods document.

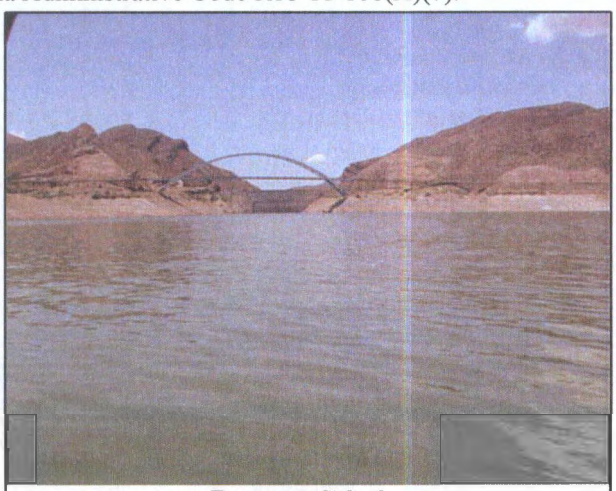
- ***Narrative Bottom Deposits Standard Implementation Procedures***
  Patrice Spindler and Steve Pawlowski, ADEQ (Draft 2006)
  This paper documents ADEQ's approach to determine compliance with the narrative bottom deposits surface water quality standard in Arizona Administrative Code R18-11-108(A)(1). Exceedances will be determined based on the percentage of fine sediments (<2mm) in riffle / run habitats in perennial streams using a Wolman pebble count procedure. An exceedance occurs when the percentage of fines in riffle habitats is >35%. An exceedance also occurs if the percentage of fines in the riffle habitats is between 20% and 35%, and a bioassessment index score indicates impairment of a biological community.

- ***Analysis of Water Quality Functions of Riparian Vegetation***
  Engineering Science (1994)
  This is a technical review of existing scientific knowledge on the functional roles of riparian vegetation in controlling surface water quality and characteristics of the riparian or wetland type that enables it to perform each function.

- ***A Guidance Document for Monitoring and Assessing the Physical Integrity of Arizona's Streams***
  Graf and C. Randall (1998)
  Basic scientific principles for understanding and describing physical integrity in terms of indicator measurements: channel width, cannel depth, channel gradient, hydraulic roughness, flow velocity, water discharge, sediment discharge, sediment particle size, channel sinuosity, channel pattern, shear stress, stream power, and bankfull conditions.

Narrative Nutrient Implementation Procedures Development – In response to EPA's National Nutrient Strategy, ADEQ is revising nutrient standards. It is starting with nutrients for lakes and reservoirs, as these waters are more likely to be impaired by nutrients than streams. ADEQ also needed to develop clear implementation procedures to apply the narrative nutrient standard in Arizona Administrative Code R18-11-108(A)(7).

To derive and implement nutrient criteria, lakes were separated into categories based on natural or inherent characteristics that cause lakes to respond to nutrients in a similar manner, and secondly, based on similar management objectives and public expectations. The following lake categories will be used in conjunction with lake nutrient standards:


Roosevelt Lake

- Deep lakes and reservoirs – Average depth over 18 feet.
  - These deep reservoirs have low nutrient and chlorophyll-a concentrations and higher Secchi depths (clarity), probably due to relatively high flushing rates, deep settling of nutrients, and sedimentation in upstream reservoirs.
- Shallow lakes – Average depth less than three meters, maximum depth of four meters.
  - These lakes are susceptible to macrophyte domination because much of the lake bottom is in the photic zone (light available). Such lakes can have relatively high Secchi depths and low-moderate chlorophyll-a concentrations.
- Urban lakes – Lakes in urban settings.
  - Urban lakes have different management objectives than other lakes. For example, they are not used or water supply or for swimming. They may have high sediment and nutrient loads from urban land uses that are impractical to control completely. Urban lakes generally have relatively poor clarity, and high chlorophyll-a and nutrient concentrations.
- Igneous and sedimentary lakes – The remaining lakes
  - These lakes are managed primarily for fishing and other recreational purposes. Data indicates that igneous watersheds are more likely to experience high chlorophyll-a and nitrogen concentrations than sedimentary lakes.

Work on developing nutrient standards has lead to the following publications:

- ***Draft - Potential Nutrient Related Targets for Lakes and Reservoirs in Arizona***
  Malcolm Pirnie, Inc for ADEQ (2005)
  Derivation of numeric nutrient water quality targets to assess lakes. Uncertainty and variability in relations

between nutrients, response variables, and designated uses was addressed by expressing the nutrient targets as a range. These nutrient targets are to be incorporated into the narrative nutrient implementation guidance document.

- **Statistical Modeling Analysis Report of Lakes and Reservoirs**
  Malcolm Pirnie, Inc for ADEQ (2004)
  This report provides the statistical basis for the narrative nutrient matrix and the lakes classification. Results can be used to determine realistic and appropriate water quality targets for different lake categories.

- ***Narrative Nutrient Standard Implementation Procedures for Lakes and Reservoirs***
  Susan Fitch, ADEQ (2006)
  This paper documents ADEQ's approach to determining and exceedance of the narrative nutrient standard in Arizona Administrative Code R18-11-108(A)(7). An exceedance is determined based on a matrix of threshold values for: chlorophyll-a, Secchi depth, blue-green algae, phosphorus, nitrogen, dissolved oxygen, and pH. In most cases, supporting evidence is needed to determine an exceedance.

- ***An Exploration of Nutrient and Community Variables in Effluent Dependent Streams in Arizona***
  David Walker (University of Arizona), Christine Goforth (University of Arizona), and Samuel Rector (ADEQ). EPA Grant Number X-828014-01-01 (2006)
  Samples were collected from five effluent dependent waters (EDWs) in 2003 – 2004. Each site was sampled once during the summer and winter, as close to the respective effluent outfalls as possible, and at some distance downstream. The downstream site was determined by attempting to find a recovery zone where dissolved oxygen increased to "normal" levels, although a recovery zone was not found in some of these EDWs.

  Diversity and pollution tolerance of aquatic macroinvertebrate assemblages are inversely related to increasing levels of pollutant loading to the receiving stream. Elevated concentration of reduced and organic forms of nitrogen, combined with low levels of dissolved oxygen, were of particular detriment to macroinvertebrates.

Other Studies and Projects

- **A Manual of Conservation Practices to reduce Pollution Loads Generated from Nonpoint Sources**
  Tetra Tech, Inc and Natural Channel Design, Inc (2004)
  The implementation appendix is a manual designed to assist landowners, managers, and technicians in adopting effective and appropriate practices to reduce nonpoint source pollutants entering streams and watercourses. In general practices described are meant to be implanted in areas immediately adjacent to the surface water; however, some treatments can be utilized effectively in uplands and other areas.

- **Assessment of Selected Inorganic Constituents in Streams in the Central Arizona Basins Study Area, Arizona and Northern Mexico, through 1998**
  David W. Anning, U.S. Geological Survey, Water-Resources Investigations Report 03-4063 (2003)
  Stream properties and water chemistry constituent concentrations were analyzed to assess water quality, determine natural and human factors affecting water quality, and compute stream loads in the Central Arizona Basins study area. Data was collected at 41 sites through 1998.

- **Use of Sediment Coring to Analyze Past Response to Disturbance**
  David Walker and Owen Davis - University of Arizona and Paul Gremillion – Northern Arizona University (Start project in 2006)
  To collect core samples from Roosevelt Lake to quantify long-term water quality trends in Roosevelt Reservoir and the Salt River watershed. The project will also determine how these watershed variables define water quality within the reservoir and how aquatic biota respond to these water quality changes.

- **Algal Toxins in the Salt River Reservoirs**

David Walker – University of Arizona , Paul Zimba – USDA, and Jo Ann Burkholder – North Carolina State University. (Start project in 2006)
Monitoring of algal and cyano-toxins in all of the Salt River Reservoirs (Roosevelt, Saguaro, Canyon, and Apache lakes) is to be expanded into a study of environmental factors needed to encourage toxin production in algae.

- **Effects of Endocrine Disrupting Compounds and Pharmaceuticals on Fish**
  David Walker (ag.arizona.edu/limnology/0306report.pdf)
  Examining the effect of endocrine disrupting compounds and pharmaceuticals left in treated wastewater effluent on relatively pollution-tolerant fish (bonytail chub) has shown that sever detrimental impacts on the population is likely due to significantly lowered 17B-estradiol levels in female fish. The study also found feminization of male fish. Very low concentrations of typical wastewater compounds were present (e.g., nutrients) in the treated effluent. Results are to be presented at the National Groundwater Associations 5th International Conference on Pharmaceuticals and Endocrine Disrupting Chemicals in water on March 13, 2006.

- **Draft Guidance for Implementing January 2001 Methylmercury Water Quality Criterion**
  EPA (August 2006)
  This document describes methods for measuring mercury and methylmercury in both tissue and water samples. This document describes how to interpret the data collected and assess designated use support.

- **Monitoring Mercury Deposition**
  Jennifer Hickman – ADEQ
  Arizona's first Mercury Deposition Network (MDN) site is being established along Sycamore Canyon, in the Raymond Boy Scout Camp near Parks, Arizona to help quantify mercury deposition. This data will be used in the development of mercury TMDLs. More information can be obtained by contacting Jennifer Hickman at: (602) 771-4542.

- **Implementation Guidance for Ambient Water Quality Criteria for Bacteria**
  U.S. EPA (November 2003 Draft)
  This document provides recommendations on the implementation of bacteria criteria for the protection of recreation uses. It provides explanations of how to assess and determine attainment of water quality standards, develop subsequent TMDL loads/wasteload allocations, and how recreational water quality criteria should be used in NPDES permits.

- **Organochlorine Compounds in Streambed Sediment and in Biological Tissue from Streams and Their Relations to Land Use, Central Arizona**
  J.B. Gebler – National Water Quality Assessment Program, U.S. Geological Survey
  The objective of the study was to determine the occurrence and distribution of organochlorine compounds (pesticides) and their relation to land use in central Arizona. Sediment samples were collected at 13 sites, and biological tissue samples at 11 sites. The greatest number of compounds and highest concentrations of many contaminants were detected at agriculture/urban sites. The compound detected most frequently in sediment and tissue samples was p,p'-DDE (a DDT metabolite).

- **Selenium – Fate and Effects in the Aquatic Environment**
  Peter M. Chapman, EVS Environment Consultants
  Proceedings of the 24th Annual British Columbia Mine Reclamation Symposium – The Technical Research Committee on Reclamation (2000)
  Series of studies by the Arid West Water Quality Research Project
  Pima County Wastewater Management, www.pima.gov/wwm/wqrp (2004)
    - Extant Criteria Evaluation – Objective to examine the appropriateness of Arizona's Water Quality Criteria for western ecosystems, identify weaknesses, and recommend further research to address weaknesses.

- Discharge Survey – Gather information to identify the nature of existing arid west surface waters receiving wastewater discharges, and species or habitats that are affected by discharges to these waters.
- Evaluation of the Reliability of the Biotic Ligand Model Predictions for Copper Toxicity in Waters Characteristic of the Arid West – A series of studies to evaluate the appropriateness of the Biotic Ligand Model to determine copper toxicity in Arizona's hard water.
- Habitat Characterization Study – Documents the physical, chemical, and biological characteristics of 10 effluent dependent waters in the arid west.
- Evaluation of Whole Effluent Toxicity Testing as an Indicator of Aquatic Health – This pilot study was designed to determine: 1) Which biological assemblages should be sampled to assess effluent impacts, 2) What are the appropriate sampling methods for macroinvertebrates and should the methods vary with the type of hydrological setting, 3) Are the proposed data and measurement quality objectives achievable on a regular basis.

Progress and Accomplishments

Are these actions working? Are we progressing or even holding our own if we continue to identify impaired waters? Can we measure effectiveness or success?

The Association of State and Interstate Water Pollution Control Administration (ASIWPCA) is asking each of the states to look for indications of progress since the 2002 listing cycle. Most of the following performance measures were chosen by ASIWPCA to evaluate national progress, but can also provide some indication of how well Arizona's monitoring and assessment programs are working.

Evaluating Progress in Monitoring and Assessment Programs – Changes in the amount of surface waters assessed is one way to evaluate ADEQ's Assessment and Monitoring Programs. The following tables show the stream miles and lake acres assessed in 2002, 2004, and 2006/2008.

These tables exclude the surface waters assessed in Category 3 (all uses "inconclusive") because by default any water not assessed would belong in this category. The assessment shows some surface waters in this category – those with any current assessment information – but no attempt is made to include all of the other waters that belong in this category, as many are unnamed washes.

Total Waters Assessed

	LAKES			STREAMS		
	2002	2004	2006/2008	2002	2004	2006/2008
	Acres			Miles		
Estimated Waters	289,630	289,630	295,590*	90,375	90,375	90,375
Waters Assessed*	40,948	67,340	88,672	1,671	2,227	2,806
Percent Assessed	14%	23%	30%	2%	2.5%	3%

*Waters Assessed excludes Category 3 – all uses assessed as "inconclusive"
*Estimated lake water size increased due to enlargement of reservoirs.

The Total Waters Assessed table (above) indicates that a very low percentage of the state's surface waters are assessed. This is primarily because the majority of waters in Arizona are ephemeral (flowing in response only to precipitation events) and not easily sampled or assessed. The Total Perennial Waters Assessed table (below) adjusts for this. Monitoring is clearly focused on perennial waters (waters that flow year round). Monitoring ephemeral and intermittent waters is limited to special investigations, such as TMDL development.

Total Perennial Waters Assessed

	LAKES			STREAMS		
	2002	2004	2006/2008	2002	2004	2006/2008
	Acres			Miles		
Estimated Perennial Waters in Arizona	168,590	168,590	174,558*	3,530	3,530	3,530
Perennial Waters Assessed*	39,873	66,264	87,773	1,405	2,081	2,685
Percent Assessed	24%	39%	50%	40%	59%	76%

* Perennial Waters Assessed excludes Category 3 – all uses assessed as "inconclusive"
*Estimated lake water size increased due to enlargement of reservoirs.

As shown in the Perennial Waters Assessed table (above), a steady increase in the percent of perennial surface waters has been occurring. Also, by comparing the total waters assessed (first table) with the total perennial waters (second table), one can see that the number of miles assessed as "inconclusive" has decreased.

Another way to look at the effort and effectiveness of these programs is to look at the number of lakes and stream reaches assessed. This is particularly revealing with lakes, as their sizes vary from less than an acre to 27,045 acres. Therefore, monitoring and assessing 20 small, but significant lakes might account for fewer acres than one large reservoir.

Assessment Units Assessed

	LAKES			STREAMS		
	2002	2004	2006/2008	2002	2004	2006/2008
	Lake Assessment Units			Stream Assessment Units		
Waters Assessed	40,948 acres	67,340 acres	88,663 acres	1,671 Miles	2,227 Miles	2,801 Miles
Assessment Units	30 units	51 units	79 units	137 units	172 units	298 units

(Excluding Category 3 – all uses assessed as "inconclusive")

The Assessment Units Assessed table (above) reveals that the number of lakes and stream reaches being successfully assessed as either "attaining" or "impaired" and been increasing steadily.

Although we could also look at changes in the number waters assessed as impaired, how should such statistics be judged? Does a decrease in impaired surface waters indicate that water quality is improving, or simply that there has been a change in assessment criteria or standards? Is listing additional waters as impaired success or failure? If the goal is to find more waters are attaining their uses, then monitoring can be targeted in more pristine waters, but does that fulfill ADEQ's goal to improve and protect water quality and natural resources? Due to these issues, ADEQ does not evaluate its Assessment, Monitoring, or even TMDL Program by the number of surface waters assessed as "impaired" or even "attaining."

Delisting Pollutants and Water Quality Improvements – The primary goal of ADEQ's water quality programs is to improve and maintain water quality in Arizona. One way to measure whether ADEQ is achieving its goal to improving water quality is look at the number of stream miles or acres "no longer impaired" (delisted). (Delistings during this cycle are shown in **Appendix E.**)

For this analysis, pollutant impairments are counted rather than the miles or acres. "Pollutant impairments" are the number of pollutants listed multiplied by the number of assessment units listed. For example, if arsenic, cadmium, chromium, copper, zinc, and pH (5 pollutants) were listed for 3 reaches of Pretty River, it would be counted as fifteen "pollutant impairments." The following table shows the number of pollutant impairments removed, using the 1989 list as the baseline for this evaluation.

Pollutants No Longer Impairing Surface Waters

		2002 ASSESSMENT	2004 ASSESSMENT	2006/2008 ASSESSMENT
TOTAL POLLUTANT IMPAIRMENTS		260	195	230
REASONS FOR DELISTING	NEW STANDARD	--	15	--
	NEW ASSESSMENT CRITERIA	81	--	--
	WATERSHED IMPROVEMENTS	22 (Gila, Munds, Pinal)	4 (Mineral, Tempe)	1 (Nutrioso)
	NEW DATA, NO WATERSHED IMPROVEMENTS	12	4	9
	NATURAL CONDITIONS	8	--	--
	OTHER	2	--	--
TOTAL DELISTED		125	23	10

The delistings in 2002 were primarily due to changes in assessment criteria that occurred when the Impaired Waters Rule and TMDL Statute were adopted. The 2004 assessment reflected new surface water quality standards (e.g. replacing the turbidity standard with a standard for suspended sediment concentration). In the current assessment (2006), delistings were primarily the result of new monitoring data showing that the standards are now being met. In only one case improvements in the watershed were demonstrated. The other delistings may be associated with intermittent pollutant loadings and drought conditions reducing pollutant loadings. Improved water quality monitoring and analysis techniques also lead to delisting at least one reach.

Over the past 3 assessments, water quality improvements have been clearly documented in only a few areas:

- Lake Havasu – Bacteria contamination at beaches in Thompson Bay were significantly reduced by implementation of strategies to increase stream flow in this back bay area, increase sanitary facilities available at the beaches, and decrease nutrient loadings from wastewater facilities (1 pollutant impairment).
- Middle Gila Pesticide Contamination Area – Dieldrin concentration in fish tissue samples dropped below detection limits after a ban on its general use for many years in Arizona. The fish consumption advisory remains in place due to DDT, toxaphene, and chlordane contamination of fish and other edible aquatic life in this area (12 pollutant impairments).
- Mineral Creek – Surface water contamination has been mitigated by extensive surface water remediation actions at mining operations along this creek (3 pollutant impairments).
- Munds Creek – Improvements in effluent reuse practices resulted in *E coli* bacteria, nitrogen, and phosphorus reductions (3 pollutant impairments).
- Pinal Creek – Extensive groundwater and surface water remediation and treatment near mining operations has resulted in significant water quality improvements (6 pollutant impairments).
- Nutrioso Creek – Grazing practices have been improved along one reach resulting in reduced sediment loading to the stream (1 pollutant impairment).
- Tempe Town Lake – A lake management plan was successfully implemented to control algal growth (that resulted in high pH) in this constructed lake (1 pollutant impairment).

Why so few documented water quality improvements? Many reasons contribute to this being a slow process, such as: most improvements require voluntary actions, the high costs to implement many actions, vast size of drainage areas containing large numbers of individual sources, and source contributions from other states, Mexico, and occasionally tribal lands. Even when actions are applied within a watershed, it may take years to see reductions in erosion. Recognizing the difficulties faced, these few documented improvements can be celebrated!

Progress in Completing and Implementing TMDLs – The number of TMDLs and implementation plans (TIPs) completed is another measure of how far we have progressed in the process of remediating water quality problems.

TMDL Progress – By Pollutant Impairments

	Assessments					
	1990- 2002	2002	2002-2004	2004	2004-2006	2006
TMDLs Scheduled		175		131		168
TMDLs Approved	63		83		18	
TMDL Implementation Plans Completed	63		83		18	
TIP Strategies Being Implemented	62		53		15	
Alternative to TMDL – Management Plan	--	1		0		1

Clearly progress is occurring in developing TMDLs and their implementation plans. However, the number of TMDLs dropped during the past two years for several reasons. The Department is taking on more complex TMDLs. State budget constraints lead to staff turnover and delays in replacing staff. Drought conditions have slowed sample collection on ephemeral and intermittent streams. What this table does not indicate is that the Department is in the later stages of several complex TMDLs, such as: Lake Mary regional mercury TMDL, Alamo Lake regional mercury TMDL, Oak Creek Phase II bacteria TMDL, Pinto Creek Phase II copper TMDL, and the Mule Gulch copper TMDL.

Appendix A

APPENDIX A
ASSESSMENT UNITS

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
A	
Agua Fria River From State Route 169 to Yarber Wash 15070102-031B	MIDDLE GILA
Agua Fria River From Sycamore Creek to Big Bug Creek 15070102-023	MIDDLE GILA
Agua Fria River From Little Squaw Creek to Cottonwood Creek 15070102-017	MIDDLE GILA
Alamo Lake 15030204-0040A	BILL WILLIAMS
Alum Gulch From headwaters to 312820/1104351 (beginning of intermittent flow) 15050301-561A	SANTA CRUZ
Alum Gulch From 312820/1104351 to 312917/1104425 (intermittent flow) 15050301-561B	SANTA CRUZ
Alvord Lake 15060106B-0050	MIDDLE GILA
Apache Lake 15060106A-0070	SALT
Aravaipa Creek From Stowe Gulch to end of Aravaipa Wilderness Area 15050203-004B	SAN PEDRO
Aravaipa Creek From Aravaipa Wilderness Area to San Pedro River 15050203-004C	SAN PEDRO
Arivaca Cienega 15050304-0001	SANTA CRUZ
Arivaca Lake 15050304-0080	SANTA CRUZ
Arnett Creek From headwaters to Queen Creek 15050100-1818	MIDDLE GILA
Ash Creek From tributary at 234537/1095222 to Gila River 15040005-040B	UPPER GILA
Ashbrook Wash From headwaters to Willow Creek 15060203-989	VERDE RIVER
Ashurst Lake 15020015-0090	LITTLE COLORADO

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
B	
Babbit Spring Wash From headwaters to Upper Lake Mary 15020015-210	LITTLE COLORADO
Babocomari River From Banning Creek to San Pedro River 15050202-004	SAN PEDRO
Barbershop Canyon Creek From headwaters to East Clear Creek 15020008-537	LITTLE COLORADO
Bartlett Lake 15060203-0110	VERDE RIVER
Bass Canyon Creek From tributary to 322606/1101318 to Hot Springs Canyon Creek 15050203-899B	SAN PEDRO
Unnamed Bass Canyon Tributary From headwaters to Bass Canyon 15050203-935	SAN PEDRO
Bear Canyon Lake 15020008-0130	LITTLE COLORADO
Bear Wallow Creek From North and South Forks of Bear Wallow to Indian Reservation boundary 15060101-023A	SALT
Beaver Creek From headwaters to Black River 15060101-008	SALT
Beaver Creek From Dry Beaver Creek to Verde River 15060202-002	VERDE RIVER
Beaver Dam Wash From Utah border to Virgin River 15010010-009	COLORADO - GRAND CANYON
Big Casa Blanca Canyon From headwaters to Sonoita Creek 15050301-606	SANTA CRUZ
Big Lake 15060101-0160	SALT
Big Sandy River From Sycamore Wash to Burro Creek 15030201-004	BILL WILLIAMS
Big Sandy River From Rupley Wash to Alamo Lake 15030201-001	BILL WILLIAMS
Bill Williams River From Alamo Lake to Castaneda Wash 15030204-003	BILL WILLIAMS

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Bill Williams River From point B to Colorado River 15030204-001	BILL WILLIAMS
Billy Creek From headwaters to Show Low Creek 15020005-019	LITTLE COLORADO
Bitter Creek From Jerome WWTP to Yavapai Apache Indian Reservation 15060202-066B	VERDE RIVER
Black River From Beaver Creek to Reservation Creek 15060101-007	SALT
Black Canyon Lake 15020010-0180	LITTLE COLORADO
Blue River From New Mexico border to KP Creek 15040004-026	UPPER GILA
Blue River From KP Creek to Strayhorse Creek 15040004-025A	UPPER GILA
Blue River From Strayhorse Creek to San Francisco River 15040004-025B	UPPER GILA
Blue John Wash From headwaters to unnamed tributary of Lynx Creek 15070102-471	MIDDLE GILA
Blue Ridge Reservoir 15020008-0200	LITTLE COLORADO
Bonita Creek From Park Creek to Gila River 15040005-030	UPPER GILA
Boulder Creek From unnamed tributary at 344114/1131800 to Wilder Creek 15030202-006B	BILL WILLIAMS
Boulder Creek From Wilder Creek to Butte Creek 15030202-005A	BILL WILLIAMS
Boulder Creek From Butte Creek to Copper Creek 15030202-005B	BILL WILLIAMS
Boulder Creek From Copper Creek to Burro Creek 15030202-005C	BILL WILLIAMS
Brewery Gulch From headwaters to Mule Gulch 15080301-337	SAN PEDRO
Bridle Creek From headwaters to Santa Maria River 15030203-027	BILL WILLIAMS
Bright Angel Creek From Phantom Creek to Colorado River 15010001-019	COLORADO - GRAND CANYON
Brown Creek From headwaters to Silver Creek 15020005-016	LITTLE COLORADO

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Buehman Canyon Creek From headwaters to end of unique water 15050203-010A	SAN PEDRO
Bunch Reservoir 15020001-0230	LITTLE COLORADO
Burro Creek From Francis Creek to Boulder Creek 15030202-008	BILL WILLIAMS
Burro Creek From Boulder Creek to Black Canyon Creek 15030202-004	BILL WILLIAMS
Butte Creek From headwaters to Burro Creek 15030202-163	BILL WILLIAMS
C	
Campaign Creek From headwaters to Pinto Creek 15060103-037	SALT
Campbell Blue River From headwaters to Blue River 15040004-028	UPPER GILA
Canyon Creek From headwaters to White Mountain Apache Reservation 15060103-014	SALT
Canyon Lake 15060106A-0250	SALT
Carnero Lake 15020001-0260	LITTLE COLORADO
Carpenter Tank 15050304-0002	SANTA CRUZ
Cash Mine Creek From headwaters to Hassayampa River 15070103-349	MIDDLE GILA
Cataract Lake 15010004-0280	COLORADO - GRAND CANYON
Cave Creek From headwaters to South Fork Cave Cr 15040006-852A	UPPER GILA
Cave Creek From South Fork Cave Creek to Coronado National Forest boundary 15040006-852B	UPPER GILA
Cave Creek From headwaters to Cave Creek Dam 15060106B-026A	MIDDLE GILA
Chaparral Park Lake 15060106B-0300	MIDDLE GILA
Cherry Creek From 340509/1105604 to Salt River 15060103-015B	SALT

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Chevelon Canyon Creek From Black Canyon Creek to Little Colorado River 15020010-001	LITTLE COLORADO
Chimenea Creek From headwaters to Rincon Creek 15050302-140	SANTA CRUZ
Cholla Lake 15020008-0320	LITTLE COLORADO
Christopher Creek From headwaters to Tonto Creek 15060105-353	SALT
Cienega Creek From headwaters to Gardner Canyon 15050302-006A	SANTA CRUZ
Cienega Creek From Gardner Canyon to USGS gage (Pantano Wash) 15050302-006B	SANTA CRUZ
Clear Creek From tributary at 360912/1115825 to Colorado River 15010001-025B	COLORADO - GRAND CANYON
Cluff Ranch Pond #3 15040005-0370	UPPER GILA
Coleman Creek From headwaters to Campbell Blue Creek 15040004-040	UPPER GILA
Colony Wash From headwaters to Verde River 15060203-998	VERDE RIVER
Colorado River From Lake Powell to Paria River 14070006-001	COLORADO - GRAND CANYON
Colorado River From Parashant Canyon to Diamond Creek 15010002-003	COLORADO - GRAND CANYON
Colorado River From Hoover Dam to Lake Mohave 15030101-015	COLORADO - LOWER GILA
Colorado River From Bill Williams River to Osborne Wash 15030104-020	COLORADO - LOWER GILA
Colorado River From Imperial Dam to Gila River 15030107-003	COLORADO - LOWER GILA
Colorado River From Main Canal to Mexico border 15030107-001	COLORADO - LOWER GILA
Colter Creek From headwaters to Nutrioso Creek 15020001-293	LITTLE COLORADO
Coon Creek From tributary at 334642/1105425 to Salt R. 15060103-039B	SALT
Coors Lake 15030202-5000	BILL WILLIAMS

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Copper Basin Wash From headwaters to unnamed tributary 15030203-032A	BILL WILLIAMS
Copper Creek From headwaters to Prospect Canyon 15050203-022A	SAN PEDRO
Cortez Park Lake 15060106B-0410	MIDDLE GILA
Cottonwood Gulch From headwaters to Pinto Creek 15060103-891	SALT
Cox Gulch From headwaters to Three R Canyon 15050301-560	SANTA CRUZ
Crescent Lake 15060101-0420	SALT
Crystal Creek From unnamed tributary at 361342/1121148 to Colorado River 15010002-018B	COLORADO - GRAND CANYON
D	
Dankworth Ponds 15040006-0440	UPPER GILA
Date Creek From Cottonwood Creek to unnamed trib. 15030203-003	BILL WILLIAMS
Deer Creek From unnamed tributary to Colorado River 15010002-019B	COLORADO - GRAND CANYON
Deer Creek From headwaters to Rye Creek 15060105-018	SALT
Dix Creek From headwaters to San Francisco River 15040004-1575	UPPER GILA
Dogtown Reservoir 15010004-0580	COLORADO - GRAND CANYON
Double R Canyon Creek From headwaters to Bass Canyon Creek 15050203-902	SAN PEDRO
Dry Creek From headwaters to Oak Creek 15060202-021	VERDE RIVER
Dubacher Canyon From headwaters to Mule Gulch 15080301-075	SAN PEDRO
E	
Eagle Creek From headwaters to tributary at 332324/1092935 15040005-028A	UPPER GILA

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Eagle Creek From Willow Creek to Sheeps Wash 15040005-027	UPPER GILA
Eagle Creek From Sheeps Wash to Gila River 15040005-025	UPPER GILA
East Clear Creek From headwaters to Yeager Creek 15020008-009	LITTLE COLORADO
East Fork Black River From headwaters to Black River 15060101-009	SALT
East Fork Little Colorado River From headwaters to Hall Creek 15020001-230	LITTLE COLORADO
East Turkey Creek From headwaters to San Simon Wash 15040006-827A	UPPER GILA
East Verde River From headwaters to Ellison Creek 15060203-022A	VERDE RIVER
East Verde River From Ellison Creek to American Gulch 15060203-022B	VERDE RIVER
East Verde River From American Gulch to Verde River 15060203-022C	VERDE RIVER
Ellis Ranch Tributary From headwaters to Pinto Creek 15060103-888	SALT
Encanto Park 15060106B-0510	MIDDLE GILA
F	
Fain Lake 15070101-0005	MIDDLE GILA
Fish Creek From headwaters to Little Colorado River 15020001-211	LITTLE COLORADO
Fish Creek From headwaters to Black River 15060101-032	SALT
Five Point Tributary From headwaters to Pinto Creek 15060103-885	SALT
Fools Hollow Lake 15020005-0530	LITTLE COLORADO
Fossil Creek From headwaters to Verde River 15060203-024	VERDE RIVER
Francis Creek From headwaters to Burro Creek 15030202-012	BILL WILLIAMS
French Gulch From headwaters to Hassayampa River 15070103-239	MIDDLE GILA

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Frye Canyon Creek From headwaters to Frye Mesa Reservoir 15040005-988A	UPPER GILA
G	
Gap Creek From Government Springs to Verde River 15060203-774B	VERDE RIVER
Gibson Mine Tributary From headwaters to Pinto Creek 15060103-887	SALT
Gila River From New Mexico border to Bitter Creek 15040002-004	UPPER GILA
Gila River From Bonita Creek to Yuma Wash 15040005-022	UPPER GILA
Gila River From Skully Creek to San Francisco River 15040002-001	UPPER GILA
Gila River From Dripping Springs Wash to San Pedro 15050100-009	MIDDLE GILA
Gila River From San Pedro River to Mineral Creek 15050100-008	MIDDLE GILA
Gila River From Salt River to Agua Fria River 15070101-015	MIDDLE GILA
Gila River From Agua Fria River to Waterman Wash 15070101-014	MIDDLE GILA
Gila River From Waterman Wash to Hassayampa R. 15070101-010	MIDDLE GILA
Gila River From Hassayampa R. to Centennial Wash 15070101-009	MIDDLE GILA
Gila River From Centennial Wash to Gillespie Dam 15070101-008	MIDDLE GILA
Gila River From Gillespie Dam to Rainbow Wash 15070101-007	MIDDLE GILA
Gila River From Rainbow Wash to Sand Tank 15070101-005	MIDDLE GILA
Gila River From Sand Tank to Painted Rocks Res. 15070101-001	MIDDLE GILA
Gila River From Coyote Wash to Fortuna Wash 15070201-003	COLORADO - LOWER GILA
Gold Gulch From headwaters to Pinto Creek 15060103-894	SALT
Granite Basin Lake 15060202-0580	VERDE RIVER

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Granite Creek From headwaters to Willow Creek 15060202-059A	VERDE RIVER
Grant Creek From headwaters to tributary at 323809/1095635 15050201-033A	SAN PEDRO
Greenback Creek From headwaters to Tonto Creek 15060105-005	SALT
H	
Haigler Creek From headwaters to tributary at 341223/1110011 15060105-012A	SALT
Hall Creek From headwaters to Little Colorado River 15020001-012	LITTLE COLORADO
Hannagan Creek From headwaters to Beaver Creek 15060101-034	SALT
Harshaw Creek From headwaters to Sonoita Creek 15050301-025	SANTA CRUZ
Hassayampa Lake 15070103-3160	MIDDLE GILA
Hassayampa River From headwaters to Copper Creek 15070103-007A	MIDDLE GILA
Hassayampa River From Copper Creek to Blind Indian Creek 15070103-007B	MIDDLE GILA
Hassayampa River From Cottonwood Cr. to Martinez Wash 15070103-004	MIDDLE GILA
Hassayampa River From Sols Wash to 8 miles below Wickenburg 15070103-002A	MIDDLE GILA
Hassayampa River From Buckeye Canal to Gila River 15070103-001B	MIDDLE GILA
Haunted Canyon From headwaters to Pinto Creek 15060103-879	SALT
Havasu Creek From Havasupi Reservation to Colorado R. 15010004-001	COLORADO - GRAND CANYON
Hay Creek From headwaters to West Fork Black River 15060101-353	SALT
Hendricks Gulch From headwaters to Mule Gulch 15080301-335	SAN PEDRO
Hermit Creek From Hermit Pack Trail to Colorado River 15010002-020B	COLORADO - GRAND CANYON
Home Creek From headwaters to West Fork Black River 15060101-339	SALT

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Horseshoe Reservoir 15060203-0620	VERDE RIVER
Horton Creek From headwaters to Beaver Creek 15060101-036	SALT
Hot Springs Canyon From headwaters to San Pedro River 15050203-013	SAN PEDRO
Humboldt Canyon From headwaters to Alum Gulch 15050301-340	SANTA CRUZ
Hunter's Hole 15030108-0660	COLORADO - LOWER GILA
I	
Indian Bend Wash From headwaters to Salt River 15060106B-179	MIDDLE GILA
J	
JD Dam Lake 15060202-0070	VERDE RIVER
JK Mountain Tributary From headwaters to Pinto Creek 15060103-873	SALT
K	
Kaibab Lake 15010004-0710	COLORADO - GRAND CANYON
Kanab Creek From Jump-up Canyon to Colorado River 15010003-001	COLORADO - GRAND CANYON
Kearny Lake 15050100-6666	MIDDLE GILA
Kennedy Lake 15050301-0720	SANTA CRUZ
Kinnikinick Lake 15020015-0730	LITTLE COLORADO
Kirkland Creek From Skull Valley to Santa Maria River 15030203-015	BILL WILLIAMS
Knight Creek From Wheeler Wash to Big Sandy River 15030201-019	BILL WILLIAMS
KP Creek From headwaters to Blue River 15040004-029	UPPER GILA
L	

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Lake Havasu 15030101-0590	COLORADO - LOWER GILA
Lake Mary (lower) 15020015-0890	LITTLE COLORADO
Lake Mary (upper) 15020015-0900	LITTLE COLORADO
Lake Mohave 15030101-0960	COLORADO - LOWER GILA
Lake Pleasant 15070102-1100	MIDDLE GILA
Lake Powell 14070006-1130	COLORADO - GRAND CANYON
Lakeside Lake 15050302-0760	SANTA CRUZ
Lee Valley Creek From headwaters to Lee Valley Reservoir 15020001-232A	LITTLE COLORADO
Lee Valley Reservoir 15020001-0770	LITTLE COLORADO
Leslie Creek From headwaters to Whitewater Draw 15080301-007	SAN PEDRO
Little Ash Creek From headwaters to Ash Creek 15070102-039	MIDDLE GILA
Little Colorado River From West Fork Little Colorado River to Water Canyon Creek 15020001-011	LITTLE COLORADO
Little Colorado River From Water Canyon Creek to Nutrioso Creek 15020001-010	LITTLE COLORADO
Little Colorado River From Nutrioso Creek to Carnero Creek 15020001-009	LITTLE COLORADO
Little Colorado River From unnamed reach to Lyman Lake 15020001-005	LITTLE COLORADO
Little Colorado River From Silver Creek to Carr Wash 15020002-004	LITTLE COLORADO
Little Colorado River From Porter Tank Draw to McDonalds W. 15020008-017	LITTLE COLORADO
Loma Verde From headwaters to Tanque Verde Wash 15050302-268	SANTA CRUZ
Long Lake (lower) 1502008-0820	LITTLE COLORADO
Luna Lake 15040004-0840	UPPER GILA

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Lyman Lake 15020001-0850	LITTLE COLORADO
Lynx Lake 15070102-0860	MIDDLE GILA
M	
Madera Canyon Creek From headwaters to 314342/1105250 15050301-322A	SANTA CRUZ
Madrona Creek From headwaters to Rincon Creek 15050302-138	SANTA CRUZ
Martinez Canyon From headwaters to Box Canyon 15050100-080	MIDDLE GILA
Martinez Lake 15030104-0880	COLORADO - LOWER GILA
Matkatamiba Creek From headwaters to Colorado River 15010002-935	COLORADO - GRAND CANYON
Minnehaha Creek From headwaters to Hassayampa Creek 15070103-029	MIDDLE GILA
Mead Canyon From headwaters to Pinto Creek 15060103-889	SALT
Miller Canyon From headwaters to Broken Arrow Ranch 15050202-409A	SAN PEDRO
Mineral Creek From headwaters to Concho Creek 15020002-648	LITTLE COLORADO
Mineral Creek From Devil's Canyon to Gila River 15050100-012B	MIDDLE GILA
Mittry Lake 15030107-0950	COLORADO - LOWER GILA
Monument Creek From headwaters to Colorado River 15010002-845	COLORADO - GRAND CANYON
Morales Canyon From headwaters to Mule Gulch 15080301-331	SAN PEDRO
Mule Gulch From headwaters to above Lavender Pit 15080301-090A	SAN PEDRO
Mule Gulch From Lavender Pit to Bisbee WWTP 15080301-090B	SAN PEDRO
Mule Gulch From Bisbee WWTP discharge to H-80 bridge 15080301-090C	SAN PEDRO
Mule Gulch From H-80 Bridge to Whitewater Draw 15080301-090D	SAN PEDRO

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Munds Creek From headwaters to Oak Creek 15060202-415	VERDE RIVER
Mural Hill Canyon From headwaters to Mule Gulch 15080301-344	SAN PEDRO
N	
Nankoweap Creek From unnamed tributary to Colorado River 15010001-033B	COLORADO - GRAND CANYON
Nelson Reservoir 15020001-1000	LITTLE COLORADO
Newman Canyon From headwaters to Upper Lake Mary 15020015-206	LITTLE COLORADO
Nogales Wash From Mexico border to Potrero Creek 15050301-011	SANTA CRUZ
North Fork Bear Wallow Creek From headwaters to Bear Wallow Creek 15060101-022	SALT
North Fork Cave Creek From headwaters to Cave Creek 15040006-856	UPPER GILA
Nutrioso Creek From headwaters to Nelson Reservoir 15020001-017A	LITTLE COLORADO
Nutrioso Creek From Nelson Reservoir to Picnic Creek 15020001-017B	LITTLE COLORADO
Nutrioso Creek From Picnic Creek to Little Colorado River 15020001-015	LITTLE COLORADO
O	
Oak Creek From headwaters to West Fork Oak Creek 15060202-019	VERDE RIVER
Oak Creek From West Fork Oak Creek to tributary at 345709/1114513 15060202-018A	VERDE RIVER
Oak Creek From tributary at 345709/1114513 to downstream Slide Rock State Park 15060202-018B	VERDE RIVER
Oak Creek From Slide Rock State Park to Dry Creek 15060202-018C	VERDE RIVER
Oak Creek From Dry Creek to Spring Creek 15060202-017	VERDE RIVER
Oak Creek From Spring Creek to Verde River 15060202-016	VERDE RIVER

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
P	
Painted Rock Borrow Pit Lake 15070201-1010	COLORADO - LOWER GILA
Painted Rocks Reservoir 15070101-1020A	MIDDLE GILA
Papago Park Ponds 15060106B-1030	MIDDLE GILA
Paria River From Utah border to Colorado River 14070007-123	COLORADO - GRAND CANYON
Parker Canyon Creek From Parker Canyon Dam to tributary at 312417/1102844 15050301-234A	SANTA CRUZ
Parker Canyon Lake 15050301-1040	SANTA CRUZ
Patagonia Lake 15050301-1050	SANTA CRUZ
Pecks Lake 15060202-1060	VERDE RIVER
Pena Blanca Lake 15050301-1070	SANTA CRUZ
Perkins Lake 15060202-1080	VERDE RIVER
Pinal Creek From Lower Pinal Creek WTP discharge to Salt River 15060103-280D	SALT
Pinto Creek From headwaters to 331927/1105456 15060103-018A	SALT
Pinto Creek From 331927/1105456 to West Fork Pinto Cr 15060103-018B	SALT
Pinto Creek From West Fork Pinto Creek to Roosevelt Lake 15060103-018C	SALT
Porter Creek From headwaters to Show Low Creek 15020005-246	LITTLE COLORADO
Potrero Creek From Interstate 19 to Santa Cruz River 15050301-500B	SANTA CRUZ
Potts Canyon From headwaters to Queen Creek 15050100-1856	MIDDLE GILA
Powers Gulch From headwaters to Haunted Canyon 15060103-884	SALT

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Q	
Queen Creek From headwaters to WWTP discharge 15050100-014A	MIDDLE GILA
Queen Creek From WWTP discharge to Potts Canyon 15050100-014B	MIDDLE GILA
Queen Creek From Potts Canyon to Whitlow Canyon 15050100-014C	MIDDLE GILA
R	
Railroad Canyon From headwaters to Upper Lake Mary 15020015-204	LITTLE COLORADO
Rainbow Lake 15020005-1170	LITTLE COLORADO
Ramsey Canyon Creek From headwaters to Forest Road 110 15050202-404A	SAN PEDRO
Red Creek From headwaters to Verde River 15060203-818	VERDE RIVER
Redfield Canyon Creek From 323339/1101841 to San Pedro River 15050203-014B	SAN PEDRO
Redrock Canyon From headwaters to Harshaw Creek 15050301-576	SANTA CRUZ
Riggs Flat Lake 15050201-1210	SAN PEDRO
Rincon Creek From headwaters to Pantano Wash 15050302-008	SANTA CRUZ
Rio de Flag From Flagstaff WWTP to San Francisco W 15020015-004B	LITTLE COLORADO
River Reservoir 15020001-1220	LITTLE COLORADO
Roosevelt Lake 15060103-1240	SALT
Roper Lake 15040006-1250	UPPER GILA
Rose Canyon Lake 15050302-1260	SANTA CRUZ
Roundtree Canyon Creek From headwaters to Tangle Creek 15060203-853	VERDE RIVER
Royal Arch Creek From headwaters to Colorado River 15010002-871	COLORADO - GRAND CANYON

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Rucker Canyon Creek From headwaters to Whitewater Draw 15080301-288	SAN PEDRO
Rye Creek From headwaters to Tonto Creek 15060105-014	SALT
S	
Sabino Canyon From 322328/1104700 to Tanque Verde W. 15050302-014B	SANTA CRUZ
Saguaro Lake 15060106A-1290	SALT
Salt River From Pinal Creek to Roosevelt Lake 15060106A-004	SALT
Salt River From Stewart Mountain Dam to Verde River 15060106A-003	SALT
Salt River From Granite Reef Dam for 2 kilometers 15060106B-001A	MIDDLE GILA
Salt River From 2 kilometers below Granite Reef Dam to Interstate 10 bridge 15060106B-001B	MIDDLE GILA
Salt River From Interstate 10 bridge to 23rd Ave WWTP discharge 15060106B-001C	MIDDLE GILA
Salt River From 23rd Ave WWTP discharge to Gila R. 15060106B-001D	MIDDLE GILA
San Francisco River From headwaters to New Mexico border 15040004-023	UPPER GILA
San Francisco River From New Mexico border to Blue River 15040004-004	UPPER GILA
San Francisco River From Blue River to Limestone Gulch 15040004-003	UPPER GILA
San Francisco River From Limestone Gulch to Gila River 15040004-001	UPPER GILA
San Pedro River From Mexico border to Charleston 15050202-008	SAN PEDRO
San Pedro River From Charleston to Walnut Gulch 15050202-006	SAN PEDRO
San Pedro River From Babocomari Creek to Dragoon W. 15050202-003	SAN PEDRO
San Pedro River From Dragoon Wash to Tres Alamos W. 15050202-002	SAN PEDRO
San Pedro River From Buehman Wash to Peppersauce W. 15050203-008	SAN PEDRO

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
San Pedro River From HUC boundary 15050203 to Hot Springs Canyon Creek 15050203-012	SAN PEDRO
San Pedro River From Hot Springs Canyon to Redfield Cyn 15050203-011	SAN PEDRO
San Pedro River From Peppersauce Wash to Aravaipa Creek 15050203-003	SAN PEDRO
San Pedro River From Aravaipa Creek to Gila River 15050203-001	SAN PEDRO
Santa Cruz River From headwaters to New Mexico border 15050301-268	SANTA CRUZ
Santa Cruz River From Mexico border to Nogales Intl WWTP discharge 15050301-010	SANTA CRUZ
Santa Cruz River From Nogales Intl WWTP to Josephine C. 15050301-009	SANTA CRUZ
Santa Cruz River From Josephine Canyon to Tubac Bridge 15050301-008A	SANTA CRUZ
Santa Cruz River From Tubac Bridge to Sopori Wash 15050301-008B	SANTA CRUZ
Santa Cruz River From Canada del Oro to HUC 15050301 15050301-001	SANTA CRUZ
Santa Fe Reservoir 15010004-1340	COLORADO - GRAND CANYON
Santa Maria River From Little Sycamore Cr. to Little Shipp W 15030203-013	BILL WILLIAMS
Santa Maria River From Bridle Creek to Date Creek 15030203-009	BILL WILLIAMS
Scholz Lake 15060202-1350	VERDE RIVER
Shinumo Creek From unnamed tributary to Colorado River 15010002-029B	COLORADO - GRAND CANYON
Show Low Creek From headwaters to Linden Wash 15020005-012	LITTLE COLORADO
Silver Creek From headwaters to Show Low Creek 15020005-013	LITTLE COLORADO
Silver Creek From Sevenmile Draw to Little Colorado R 15020005-001	LITTLE COLORADO
Skunk Creek From headwaters to Agua Fria River 15070102-003	MIDDLE GILA

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Snake River From headwaters to Black River 15060101-045	SALT
Snow Flat Lake 15050201-1420	SAN PEDRO
Soldier's Annex Lake 15020008-1430	LITTLE COLORADO
Soldier's Lake 15020008-1440	LITTLE COLORADO
Sonoita Creek From 750 feet below Patagonia WWTP discharge Patagonia Lake 15050301-013C	SANTA CRUZ
South Fork Bear Wallow Creek From headwaters to Bear Wallow Creek 15060101-258	SALT
South Fork Cave Creek From headwaters to Cave Creek 15040006-849	UPPER GILA
Spring Canyon Creek From headwaters to Colorado River 15010002-318	COLORADO - GRAND CANYON
Spring Creek From headwaters to Mule Gulch 15080301-333	SAN PEDRO
Spring Creek From Coffee Creek to Oak Creek 15060202-022	VERDE RIVER
Spring Creek From headwaters to Tonto Creek 15060105-010	SALT
Sterling Canyon From headwaters to Oak Creek 15060202-424	VERDE RIVER
Stinky Creek From headwaters to Fort Apache Res. 15060101-352	SALT
Stoneman Lake 15060202-1490	VERDE RIVER
Sycamore Canyon From headwaters to Mexico Border 15080200-002	SANTA CRUZ
Sycamore Creek From Cedar Creek to Verde River 15060202-026	VERDE RIVER
Sycamore Creek From headwaters to Verde River 15060203-055	VERDE RIVER
Sycamore Creek From Tank Canyon to Agua Fria River 15070102-024B	MIDDLE GILA
T	

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Tapeats Creek From headwaters to Colorado River 15010002-696	COLORADO - GRAND CANYON
Tempe Town Lake 15050100-1588	MIDDLE GILA
Thomas Creek From headwaters to Beaver Creek 15060101-285	SALT
Three R Canyon From headwaters to 312835/1104619 (where intermittent flow begins) 15050301-558A	SANTA CRUZ
Three R Canyon From 312835/1104619 to 312827/1104712 15050301-558B	SANTA CRUZ
Three R Canyon From 312827/1104712 to Sonoita Creek 15050301-558C	SANTA CRUZ
Tonto Creek From headwaters to 341810/1110414 15060105-013A	SALT
Tonto Creek From 341810/1110414 to Haigler Creek 15060105-013B	SALT
Tonto Creek From Rye Creek to Gun Creek 15060105-008	SALT
Trout Creek From Cow Creek to Knight Creek 15030201-014	BILL WILLIAMS
Tunnel Reservoir 15020001-1550	LITTLE COLORADO
Turkey Creek From headwaters to unnamed tributary 15070102-036A	MIDDLE GILA
Turkey Creek From unnamed tributary to Poland Creek 15070102-036B	MIDDLE GILA
Turkey Creek From headwaters to Rock Creek 15050201-002A	SAN PEDRO
Turkey Creek From headwaters to Campbell Blue Creek 15040004-060	UPPER GILA
Twin Pond 15080302-0001	SAN PEDRO
U	
Unnamed tributary to Cash Mine Creek From headwaters to Cash Mine Creek 15070103-415	MIDDLE GILA
Unnamed tributary to Cox Gulch From headwaters to Cox Gulch 15050301-890	SANTA CRUZ
Unnamed tributary to Lynx Creek From headwaters to Lynx Creek 15070102-124	MIDDLE GILA

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Unnamed tributary to Harshaw Creek (Endless Chain Mine tributary) 15050301-888	SANTA CRUZ
Unnamed tributary to Three R Canyon From headwaters to Three R Canyon 15050301-889	SANTA CRUZ
V	
Verde River From Granite Creek to Hell Canyon 15060202-052	VERDE
Verde River From unnamed tributary (15060202-065) to Railroad Draw 15060202-037	VERDE
Verde River From Sycamore Creek to Oak Creek 15060202-025	VERDE
Verde River From Oak Creek to Beaver Creek 15060202-015	VERDE
Verde River From 15060203 boundary to West Clear Creek 15060203-027	VERDE
Verde River From West Clear Creek to Fossil Creek 15060203-025	VERDE
Verde River From Tangle Creek to Ista Flat 15060203-018	VERDE
Verde River From Horseshoe Dam to Alder Creek 15060203-008	VERDE
Verde River From Bartlett Dam to Camp Creek 15060203-004	VERDE
Virgin River From Black Rock Gulch to Sullivan's Canyon 15010010-006	COLORADO – GRAND CANYON
Virgin River From Sullivan's Canyon to Beaver Dam Wash 15010010-004	COLORADO – GRAND CANYON
Virgin River From Beaver Dam Wash to Big Bend Wash 15010010-003	COLORADO – GRAND CANYON
W	
Walnut Creek From Apache Creek to Big Chino Wash 15060201-017	VERDE RIVER
Ward Canyon From headwaters to Turkey Creek 15050201-433	SAN PEDRO
Watson Lake 15060202-1590	VERDE RIVER
West Clear Creek From Meadow Canyon to Verde River 15060203-026B	VERDE RIVER

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
West Fork Black River From Indian Reservation to Black River 15060101-048	SALT
West Fork Little Colorado River From headwaters to Government Springs 15020001-013A	LITTLE COLORADO
West Fork Little Colorado River From Government Springs to Little Colorado River 15020001-013B	LITTLE COLORADO
West Fork Oak Creek From headwaters to Oak Creek 15060202-020	VERDE RIVER
West Fork Pinto Creek From headwaters to Pinto Creek 15060103-066	SALT
Wet Beaver Creek From Long Canyon to Rarick Creek 15060202-004	VERDE RIVER
Wet Beaver Creek From Rarick Creek to Dry Beaver Creek 15060202-003	VERDE RIVER
Whitehorse Lake 15060202-1630	VERDE RIVER

SURFACE WATER DESCRIPTION REACH NUMBER	WATERSHED
Whitewater Draw From Gadwell Canyon to unnamed tributary 15080301-004	SAN PEDRO
Whitewater Draw From tributary at 312036/1093446 to Mexico border 15080301-002B	SAN PEDRO
Wilder Creek From headwaters to Boulder Creek 15030202-007	BILL WILLIAMS
Willow Creek From headwaters to Beaver Creek 15060101-049	SALT
Willow Creek Reservoir 15060202-1660	VERDE
Willow Springs Lake 15020010-1670	LITTLE COLORADO
Winwood Canyon From headwaters to Mule Gulch 15080301-340	SAN PEDRO
Woods Canyon Lake 15020010-1700	LITTLE COLORADO

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Appendix B

APPENDIX B
Assessments by Category

Category 1 – Attaining All Uses

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles / acres)
BILL WILLIAMS WATERSHED	
Bill Williams River From point B to Colorado River 15030204-001	17.5 mi
Date Creek From Cottonwood Creek to unnamed tributary 15030203-003	34.1 mi
Francis Creek From headwaters to Burro Creek 15030202-012	23.8 mi
COLORADO – GRAND CANYON WATERSHED	
Clear Creek From unnamed tributary at 360912/1115825 to Colorado River 15010001-025B	8.1 mi
Havasu Creek From Havasupi Indian Reservation to Colorado River 15010004-001	3.3 mi
Matkatamiba Creek From headwaters to Colorado River 15010002-935 *(Also in Category 4N due to natural impairment by selenium)*	12.5 mi
Royal Arch Creek From headwaters to Colorado River 15010002-871 *(Also in Category 4N due to natural impairment by selenium)*	5.1 mi
Spring Canyon Creek From headwaters to Colorado River 15010002-318	6 mi
COLORADO – LOWER GILA WATERSHED	
Colorado River From Imperial Dam to Gila River 15030107-003	15.3 mi
Martinez Lake 15030104-0880	600 a
LITTLE COLORADO WATERSHED	
Barbershop Canyon Creek From headwaters to East Clear Creek 15020008-537	10.2 mi
Chevelon Canyon Creek From Black Canyon Creek to Little Colorado River 15020010-001	19.3 mi
Colter Creek From headwaters to Nutrioso Creek 15020001-293	8.6 mi
East Clear Creek From headwaters to Yeager Creek 15020008-009	38 mi
East Fork Little Colorado River From headwaters to Hall Creek 15020001-230	10.6 mi
Mineral Creek From headwaters to Concho Creek 15020002-648	25.8 mi
Nutrioso Creek From headwaters to Nelson Reservoir 15020001-017A	13.3 mi

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles / acres)
Porter Creek From headwaters to Show Low Creek 15020005-246	4.4 mi
Rio de Flag From Flagstaff WWTP to San Francisco Wash 15020015-004B	3.7 mi
Show Low Creek From headwaters to Linden Wash 15020005-012	19.5 mi
Silver Creek From headwaters to Show Low Creek 15020005-013	33.6 mi
MIDDLE GILA WATERSHED	
Agua Fria River From State Route 169 to Yarber Wash 15070102-031B	17.8 mi
Agua Fria River From Sycamore Creek to Big Bug Creek 15070102-023	9.1 mi
Agua Fria River From Little Squaw Creek to Cottonwood Creek 15070102-017	5.8 mi
Arnett Creek From headwaters to Queen Creek 15050100-1818	11.1 mi
Cave Creek From headwaters to Cave Creek Dam 15060106B-026A	32.9 mi
Gila River From Dripping Springs Wash to San Pedro River 15050100-009	11 mi
Hassayampa River From Copper Creek to Blind Indian Creek 15070103-007B	20 mi
Sycamore Creek From Tank Canyon to Agua Fria River 15070102-024B	17.6 mi
SALT WATERSHED	
Campaign Creek From headwaters to Pinto Creek 15060103-037	16.6 mi
Canyon Creek From headwaters to White Mountain Apache Reservation 15060103-014	8.6 mi
Cherry Creek From tributary at 340509/1105604 to Salt River 15060103-015B	40.9 mi
Coon Creek From tributary at 334642/1105425 to Salt River 15060103-039B	10.1 mi
Deer Creek From headwaters to Rye Creek 15060105-018	11.9 mi
East Fork Black River From headwaters to Black River 15060101-009	26.7 mi
Greenback Creek From headwaters to Tonto Creek 15060105-005	16.4 mi
Haigler Creek From headwaters to tributary at 341223/1110011 15060105-012A	15.4 mi

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles / acres)
Tonto Creek From Rye Creek to Gun Creek 15060105-008	4.7 mi
SAN PEDRO WATERSHED	
Aravaipa Creek From Stowe Gulch to end of Aravaipa Wilderness Area 15050203-004B	15.5 mi
Aravaipa Creek From Aravaipa Wilderness Area to San Pedro River 15050203-004C	12.6 mi
Babocomari River From Banning Creek to San Pedro River 15050202-004	32.7 mi
Bass Canyon Creek From tributary to 322606/1101318 to Hot Springs Canyon Creek 15050203-899B	7.9 mi
Unnamed Bass Canyon Tributary From headwaters to Bass Canyon 15050203-035	1 mi
Buehman Canyon Creek From headwaters to end of unique water 15050203-010A	10.5 mi
Double R Canyon Creek From headwaters to Bass Canyon Creek 15050203-902	5 mi
San Pedro River From Charleston to Walnut Gulch 15050202-006	8.9 mi
SANTA CRUZ WATERSHED	
Cienega Creek From headwaters to Gardner Canyon 15050302-006A	18.08 mi
Cienega Creek From Gardner Canyon to USGS gage (Pantano Wash) 15050302-006B	28.8 mi
Redrock Canyon From headwaters to Harshaw Creek 15050301-576	12.7 mi
Santa Cruz River From headwaters to New Mexico border 15050301-268	13.9 mi
UPPER GILA WATERSHED	
Ash Creek From tributary at 234537/1095222 to Gila River 15040005-040B	14.7 mi
Bonita Creek From Park Creek to Gila River 15040005-030	14.6 mi
Campbell Blue River From headwaters to Blue River 15040004-028	19.7 mi
Cave Creek From South Fork Cave Creek to Coronado National Forest boundary 15040006-852B	1.5 mi
Eagle Creek From headwaters to tributary at 332324/1092935 15040005-028A	11.8 mi
Eagle Creek From Willow Creek to Sheeps Wash 15040005-027	5.8 mi
Eagle Creek From Sheeps Wash to Gila River 15040005-025	41.8 mi

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles / acres)
KP Creek From headwaters to Blue River 15040004-029	12.1 mi
San Francisco River From headwaters to New Mexico border 15040004-023	13.1 mi
South Fork Cave Creek From headwaters to Cave Creek 15040006-849	8.1 mi
VERDE WATERSHED	
Bartlett Lake 15060203-0110	2375 a
Fossil Creek From headwaters to Verde River 15060203-024	19.9 mi
Gap Creek From Government Springs to Verde River 15060203-774B	5.4 mi
Munds Creek From headwaters to Oak Creek 15060202-415	17 mi
Oak Creek From Spring Creek to Verde River 15060202-016	12.7 mi
Red Creek From headwaters to Verde River 15060203-818	13.6 mi
Sycamore Creek From Cedar Creek to Verde River 15060202-026	11.7 mi
Sycamore Creek From headwaters to Verde River 15060203-055	13.2 mi
Verde River From Granite Creek to Hell Canyon 15060202-052	16.4 mi
Verde River From Tangle Creek to Ista Flat 15060203-018	4.1 mi
Verde River From Bartlett Dam to Camp Creek 15060203-004	6.85 mi
West Clear Creek From Meadow Canyon to Verde River 15060203-026B	23.5 mi
West Fork Oak Creek From headwaters to Oak Creek 15060202-020	15.8 mi
Wet Beaver Creek From Long Canyon to Rarick Creek 15060202-004	6.5 mi

Category 1 -- Attaining All Uses:

Total # of lakes (*acres*): 2 (*2,975*)

Total # of stream reaches (*miles*): 72 (*1,066.7*)

Category 2 – Attaining Some Uses

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	PLANNING LIST POLLUTANTS OF CONCERN
BILL WILLIAMS WATERSHED		
Big Sandy River From Sycamore Wash to Burro Creek 15030201-004	13.8 mi	*E. coli*, SSC, dissolved oxygen, mercury
Big Sandy River From Rupley Wash to Alamo Lake 15030201-001	10.2 mi	Mercury
Boulder Creek From unnamed tributary at 344114 / 1131800 to Wilder Creek 15030202-006B	14.4 mi	Mercury, beryllium, suspended sediment
Boulder Creek From Copper Creek to Burro Creek 15030202-005C	5 mi	Mercury, selenium
Burro Creek From Boulder Creek to Black Canyon Creek 15030202-004	17.2 mi	Sediment
Kirkland Creek From Skull Valley to Santa Maria River 15030203-015	22.6 mi	*E coli*
Santa Maria River From Bridle Creek to Date Creek 15030203-009	24.5 mi	Mercury, SSC
Trout Creek From Cow Creek to Knight Creek 15030201-014	32.1 mi	*E. coli*, mercury
COLORADO – GRAND CANYON WATERSHED		
Beaver Dam Wash From Utah border to Virgin River 15010010-009	9.6 mi	*E. coli*, lead, SSC
Bright Angel Creek From Phantom Creek to Colorado River 15010001-019	1.9 mi	SSC
Crystal Creek From unnamed tributary at 361342/1121148 to Colorado River 15010002-018B	9.1 mi	Arsenic
Deer Creek From unnamed tributary to Colorado River 15010002-019B	4.9 mi	Lead, selenium, SSC
Dogtown Reservoir 15010004-0580	70 a	Low dissolved oxygen, high pH, selenium
Hermit Creek From Hermit Pack Trail crossing to Colorado River 15010002-020B	3.5 mi	Selenium
Kanab Creek From Jump-up Canyon to Colorado River 15010003-001	12.8 mi	Lead, SSC
Monument Creek From headwaters to Colorado River 15010002-845	3.5 mi	Mercury *(Also in Category 4N due to natural impairment by selenium)*
Nankoweap Creek From unnamed tributary to Colorado River 15010001-033B	7.3 mi	SSC
Shinumo Creek From unnamed tributary to Colorado River 15010002-029B	8.8 mi	SSC
Tapeats Creek From headwaters to Colorado River 15010002-696	12.8 mi	SSC
Virgin River From Black Rock Gulch to Sullivan's Canyon 15010010-006	10.3 mi	*E. coli*, lead, SSC, selenium

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	PLANNING LIST POLLUTANTS OF CONCERN
Virgin River From Sullivan's Canyon to Beaver Dam Wash 15010010-004	9.7 mi	*E. coli*, lead, SSC, selenium
COLORADO – LOWER GILA WATERSHED		
Colorado River From Bill Williams River to Osborne Wash 15030104-020	13.4 mi	Selenium
Lake Havasu 15030101-0590	19,780 a	*E. coli*, mercury, selenium
Lake Mohave 15030101-0960	27,045 a	Selenium
Mittry Lake 15030107-0950	385 a	
LITTLE COLORADO WATERSHED		
Ashurst Lake 15020015-0090	200 a	Low dissolved oxygen
Babbit Spring Wash From headwaters to Upper Lake Mary 15020015-210	2.3 mi	mercury
Bear Canyon Lake 15020008-0130	55 a	Low pH
Billy Creek From headwaters to Show Low Creek 15020005-019	18.5 mi	*E. coli*
Black Canyon Lake 15020010-0180	35 a	Low dissolved oxygen
Blue Ridge Reservoir 15020008-0200	290 a	
Carnero Lake 15020001-0260	65 a	Low dissolved oxygen, high pH
Kinnikinick Lake 15020015-0730	115 a	Lead
Lake Mary (upper) 15020015-0900	860 a	Mercury, copper, low dissolved oxygen, nickel, zinc
Lee Valley Reservoir 15020001-0770	35 a	Nitrogen
Lyman Lake 15020001-0850	1,310 a	Mercury, low dissolved oxygen
Soldier's Lake 15020008-1440	28 a	Mercury, low dissolved oxygen
West Fork Little Colorado River From headwaters to Government Springs 15020001-013A	9.1 mi	Mercury
West Fork Little Colorado River From Government Springs to Little Colorado River 15020001-013B	2.2 mi	Copper
Woods Canyon Lake 15020010-1700	70 a	Low dissolved oxygen
MIDDLE GILA WATERSHED		
Fain Lake 15070101-0005	1,015 a	Low dissolved oxygen
Gila River From Salt River to Agua Fria River 15070101-015	3.7 mi	DDT, toxaphene, chlordane
Hassayampa River From Cottonwood Creek to Martinez Wash 15070103-004	32.1 mi	*E. coli*
Hassayampa River From Sols Wash to 8 miles below Wickenburg 15070103-002A	9.2 mi	*E. coli*
Hassayampa River From Buckeye Canal to Gila River 15070103-001B	2.3 mi	DDT, toxaphene, chlordane, selenium

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	PLANNING LIST POLLUTANTS OF CONCERN
Lake Pleasant 15070102-1100	8000 a	Mercury in fish tissue
Lynx Lake 15070102-0860	50 a	Lead, manganese
Martinez Canyon From headwaters to Box Canyon 15050100-080	9.5 mi	Lead
Salt River From Granite Reef Dam for 2 kilometers 15060106B-001A	1.6 mi	Chromium, lead
Salt River From 23rd Avenue WWTP discharge to Gila River 15060106B-001D	14.1 mi	DDT, toxaphene, chlordane
Tempe Town Lake 15060106B-1588	220 a	*E. coli*
Turkey Creek From headwaters to unnamed tributary 15070102-036A	9.1 mi	
SALT WATERSHED		
Bear Wallow Creek From No/So Forks of Bear Wallow to Indian Reservation 15060101-023A	5.9 mi	
Beaver Creek From headwaters to Black River 15060101-008	13.1 mi	Low dissolved oxygen, phosphorus
Big Lake 15060101-0160	440 a	
Black River From Beaver Creek to Reservation Creek 15060101-007	13.1 mi	
Crescent Lake 15060101-0420	155 a	High pH
Fish Creek From headwaters to Black River 15060101-032	13.8 mi	
Haunted Canyon From headwaters to Pinto Creek 15060103-879	6.8 mi	Copper
Pinal Creek From Lower Pinal Creek WTP discharge to Salt River 15060103-280D	6.4 mi	Cadmium, zinc
Roosevelt Lake 15060103-1240	18,350 a	
Rye Creek From headwaters to Tonto Creek 15060105-014	17.8 mi	
Saguaro Lake 15060106A-1290	1,025 a	
Spring Creek From headwaters to Tonto Creek 15060105-010	20.5 mi	
West Fork Black River From Indian Reservation boundary to Black River 15060101-048	14.6 mi	
SAN PEDRO WATERSHED		
Copper Creek From headwaters to Prospect Canyon 15050203-022A	6.6 mi	Copper
Grant Creek From headwaters to tributary at 323809/1095635 15050201-033A	6.8 mi	
Hot Springs Canyon From headwaters to San Pedro River 15050203-013	25.9 mi	Copper

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	PLANNING LIST POLLUTANTS OF CONCERN
Ramsey Canyon Creek From headwaters to Forest Road 110 15050202-404A	4.4 mi	Mercury
Rucker Canyon Creek From headwaters to Whitewater Draw 15080301-288	10.4 mi	
San Pedro River From Mexico border to Charleston 15050202-008	28.3 mi	*E. coli*, SSC, selenium, mercury
San Pedro River From Hot Springs Canyon Creek to Redfield Canyon 15050203-011	16 mi	Copper, *E. coli*
San Pedro River From Buehman Wash to Peppersauce Wash 15050203-008	16.4 mi	Chromium, copper, *E. coli*, lead, SSC
Turkey Creek From headwaters to Rock Creek 15050201-002A	13.1 mi	
Ward Canyon From headwaters to Turkey Creek 15050201-433	3 mi	
SANTA CRUZ WATERSHED		
Chimenea Creek From headwaters to Rincon Creek 15050302-140	8 mi	
Madera Canyon Creek From headwaters to unnamed tributary at 314342/1105250 15050301-322A	2.3 mi	
Parker Canyon Lake 15050301-1040	130 a	Mercury, low dissolved oxygen
Patagonia Lake 15050301-1050	230 a	Low dissolved oxygen
Rose Canyon Lake 15050302-1260	7 a	Low pH
Sabino Canyon From tributary at 322328/1104700 to Tanque Verde W. 15050302-014B	14.1 mi	Cyanide, lead, manganese, selenium
Santa Cruz River From Nogales Intl WWTP discharge to Josephine Canyon 15050301-009	9.1 mi	
Santa Cruz River From Josephine Canyon to Tubac Bridge 15050301-008A	4.8 mi	Chlorine
Santa Cruz River From Canada del Oro to HUC boundary 15050301 15050301-001	8.6 mi	Chlorine
UPPER GILA WATERSHED		
Blue River From New Mexico border to KP Creek 15040004-026	21.4 mi	
Blue River From KP Creek to Strayhorse Creek 15040004-025A	3.8 mi	
Dankworth Ponds 15040006-0440	8 a	Selenium *(Also in Category 4N due to natural impairment by low DO)*
Roper Lake 15040006-1250	25 a	*(Also in Category 4N due to natural impairment by low dissolved oxygen)*
San Francisco River From New Mexico border to Blue River 15040004-004	20.9 mi	
San Francisco River From Limestone Gulch to Gila River 15040004-001	12.8 mi	*E. coli*

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	PLANNING LIST POLLUTANTS OF CONCERN
VERDE WATERSHED		
Bitter Creek From Jerome WWTP to Yavapai Apache Indian Reservation 15060202-066B	1.6 mi	Selenium
East Verde River From headwaters to Ellison Creek 15060203-022A	8.1 mi	Low dissolved oxygen
Granite Basin Lake 15060202-0580	7 a	Ammonia, arsenic, manganese, high pH *(Also in Category 4N due to natural impairment by low dissolved oxygen)*
JD Dam Lake 15060202-0070	28 a	
Roundtree Canyon Creek From headwaters to Tangle Creek 15060203-853	10.7 mi	Copper
Scholz Lake 15060202-1350	22 a	Low dissolved oxygen
Sterling Canyon From headwaters to Oak Creek 15060202-424	3 mi	
Whitehorse Lake 15060202-1630	40 a	

Category 2 -- Attaining Some Uses:

Total # of lakes (*acres*): 32 (*80,095*)

Total # of stream reaches (*miles*): 66 (*733.2*)

Category 3 – All Uses Inconclusive

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	PLANNING LIST POLLUTANTS OF CONCERN
BILL WILLIAMS WATERSHED		
Bridle Creek From headwaters to Santa Maria River 15030203-027	25.8 mi	Mercury, SSC
Burro Creek From Francis Creek to Boulder Creek 15030202-008	13.8 mi	Chromium, mercury
Butte Creek From headwaters to Burro Creek 15030202-163	2.8 mi	Mercury
Coors Lake 15030202-5000	230 a	Mercury
Copper Basin Wash From headwaters to unnamed tributary 15030203-032A	4.6 mi	Copper, lead, selenium
Knight Creek From Wheeler Wash to Big Sandy River 15030201-019	9.9 mi	Mercury, SSC
Wilder Creek From headwaters to Boulder Creek 15030202-007	15.3 mi	
COLORADO – GRAND CANYON WATERSHED		
Cataract Lake 15010004-0280	35 a	Ammonia, manganese
Kaibab Lake 15010004-0710	60 a	
Lake Powell 14070006-1130	9,770 a	
Santa Fe Reservoir 15010004-1340	12 a	Copper
COLORADO – LOWER GILA WATERSHED		
Hunter's Hole 15030108-0660	15 a	Selenium
LITTLE COLORADO WATERSHED		
Brown Creek From headwaters to Silver Creek 15020005-016	14.5 mi	
Bunch Reservoir 15020001-0230	65 a	Low dissolved oxygen
Cholla Lake 15020008-0320	130 a	
Fish Creek From headwaters to Little Colorado River 15020001-211	9 mi	Mercury
Fools Hollow Lake 15020005-0530	150 a	Low dissolved oxygen, selenium
Hall Creek From headwaters to Little Colorado River 15020001-012	14.3 mi	
Lake Mary (lower) 15020015-0890	765 a	DO, high pH, mercury
Lee Valley Creek From headwaters to Lee Valley Reservoir 15020001-232A	1.6 mi	
Long Lake (lower) 15020008-0820	320 a	Mercury, high pH
Nelson Reservoir 15020001-1000	65 a	Low dissolved oxygen
Newman Canyon From headwaters to Upper Lake Mary 15020015-206	9.1 mi	Mercury

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	PLANNING LIST POLLUTANTS OF CONCERN
Railroad Canyon From headwaters to Upper Lake Mary 15020015-204	5.4 mi	
River Reservoir 15020001-1220	140 a	
Silver Creek From Sevenmile Draw to Little Colorado River 15020005-001	9.3 mi	
Soldier's Annex Lake 15020008-1430	120 a	Mercury
Tunnel Reservoir 15020001-1550	40 a	Low dissolved oxygen, nitrogen
Willow Springs Lake 15020010-1670	160 a	Low dissolved oxygen, selenium
MIDDLE GILA WATERSHED		
Blue John Wash From headwaters to unnamed tributary of Lynx Creek 15070102-471	1 mi	Zinc
Encanto Park Lake 15060106B-0510	8 a	
Gila River From Agua Fria River to Waterman Wash 15070101-014	11.9 mi	DDT, toxaphene, chlordane
Gila River From Waterman Wash to Hassayampa River 15070101-010	13.9 mi	DDT, toxaphene, chlordane
Gila River From Hassayampa River to Centennial Wash 15070101-009	7 mi	DDT, toxaphene, chlordane
Gila River From Gillespie Dam to Rainbow Wash 15070101-007	5.1 mi	DDT, toxaphene, chlordane
Gila River From Rainbow Wash to Sand Tank 15070101-005	16.9 mi	DDT, toxaphene, chlordane
Gila River From Sand Tank to Painted Rocks Reservoir 15070101-001	18.7 mi	DDT, toxaphene, chlordane
Hassayampa Lake 15070103-3160	2 a	Copper, lead
Indian Bend Wash From headwaters to Salt River 15060106B-179	4.8 mi	Lead
Kearny Lake 15050100-6666	8 a	
Little Ash Creek From headwaters to Ash Creek 15070102-039	17.7 mi	
Unnamed tributary to Lynx Creek From headwaters to Lynx Creek 15070102-124	1 mi	Cadmium, copper, zinc
Minnehaha Creek From headwaters to Hassayampa Creek 15070103-029	12.7 mi	
Painted Rocks Reservoir 15070101-1020A	100 a	DDT, toxaphene, chlordane
Papago Park Ponds 15060106B-1030	24 a	
Potts Canyon From headwaters to Queen Creek 15050100-1856	10.6 mi	Arsenic, copper, lead, mercury, SSC
Queen Creek From Potts Canyon to Whitlow Canyon 15050100-014C	8 mi	Arsenic, copper, mercury, SSC

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	PLANNING LIST POLLUTANTS OF CONCERN
Salt River From 2 kilometers below Granite Reef Dam to Interstate 10 bridge 15060106B-001B	19 mi	
Salt River From Interstate 10 bridge to 23rd Ave WWTP discharge 15060106B-001C	7.9 mi	Chromium, lead
Skunk Creek From headwaters to Agua Fria River 15070102-003	30.4 mi	Lead
SALT WATERSHED		
Cottonwood Gulch From headwaters to Pinto Creek 15060103-891	1.9 mi	
Ellis Ranch Tributary From headwaters to Pinto Creek 15060103-880	1 mi	Low pH *(Also in Category 4N due to natural impairment by copper)*
Gold Gulch From headwaters to Pinto Creek 15060103-894	3.3 mi	
Hannagan Creek From headwaters to Beaver Creek 15060101-034	7.2 mi	
Hay Creek From headwaters to West Fork Black River 15060101-353	4.5 mi	
Home Creek From headwaters to West Fork Black River 15060101-339	9.1 mi	
Horton Creek From headwaters to Beaver Creek 15060101-036	4.6 mi	
JK Mountain Tributary From headwaters to West Fork Pinto Creek 15060103-873	1.1 mi	*(Also in Category 4N due to natural impairment by copper)*
Mead Canyon From headwaters to Pinto Creek 15060103-889	2.4 mi	*(Also in Category 4N due to natural impairment by copper)*
North Fork Bear Wallow Creek From headwaters to Bear Wallow Creek 15060101-022	5.2 mi	
Powers Gulch From headwaters to Haunted Canyon 15060103-884	3.8 mi	Copper
Snake River From headwaters to Black River 15060101-045	6.2 mi	
South Fork Bear Wallow Creek From headwaters to Bear Wallow Creek 15060101-258	3.8 mi	
Stinky Creek From headwaters to Fort Apache Reservation 15060101-352	2.1 mi	
Thomas Creek From headwaters to Beaver Creek 15060101-285	4.1 mi	
West Fork Pinto Creek From headwaters to Pinto Creek 15060103-066	11.6 mi	Copper
Willow Creek From headwaters to Beaver Creek 15060101-049	7 mi	
SAN PEDRO WATERSHED		

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	PLANNING LIST POLLUTANTS OF CONCERN
Dubacher Canyon From headwaters to Mule Gulch 15080301-075	3 mi	Copper, high pH
Hendricks Gulch From headwaters to Mule Gulch 15080301-335	0.5 mi	
Leslie Creek From headwaters to Whitewater Draw 15080301-007	24.5 mi	Low dissolved oxygen
Miller Canyon From headwaters to Broken Arrow Ranch 15050202-409A	4.3 mi	
Morales Canyon From headwaters to Mule Gulch 15080301-331	2 mi	Copper
Mule Gulch From Highway 80 Bridge to Whitewater Draw 15080301-090D	4.5 mi	Copper, low pH
Mural Hill Canyon From headwaters to Mule Gulch 15080301-344	2.2 mi	Copper, lead
Redfield Canyon Creek From tributary at 323339/1101841 to San Pedro River 15050203-014B	32.5 mi	
Riggs Flat Lake 15050201-1210	9 a	
San Pedro River From HUC 15050203 to Hot Springs Canyon Creek 15050203-012	17.1 mi	
San Pedro River From Peppersauce Wash to Aravaipa Creek 15050203-003	21.3 mi	Copper, lead
Snow Flat Lake 15050201-1420	0.5 a	
Spring Creek From headwaters to Mule Gulch 15080301-333	1 mi	
Twin Pond 15080302-0001	1 a	
Whitewater Draw From Gadwell Canyon to tributary with reach #15080301-003 15080301-004	22.2 mi	
Whitewater Draw From tributary at 312036/1093446 to Mexico border 15080301-002B	0.4 mi	
Winwood Canyon From headwaters to Mule Gulch 15080301-340	1 mi	Copper
SANTA CRUZ WATERSHED		
Arivaca Cienega 15050304-0001	3 a	
Big Casa Blanca Canyon From headwaters to Sonoita Creek 15050301-606	3 mi	
Carpenter Tank 15050304-0002	3 a	
Kennedy Lake 15050301-0720	10 a	
Loma Verde From headwaters to Tanque Verde Wash 15050302-268	4 mi	Low dissolved oxygen
Madrona Creek From headwaters to Rincon Creek 15050302-138	7 mi	

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	PLANNING LIST POLLUTANTS OF CONCERN
Parker Canyon Creek From Parker Canyon Dam to tributary at 312417/1102844 15050301-234A	3 mi	
Potrero Creek From Interstate 19 to Santa Cruz River 15050301-500B	4.9 mi	*E. coli*
Rincon Creek From headwaters to Pantano Wash 15050302-008	16.2 mi	
Santa Cruz River From Tubac Bridge to Sopori Wash 15050301-008B	8.9 mi	*E. coli*
Sycamore Canyon From headwaters to Mexico Border 15080200-002	9.9 mi	
UPPER GILA WATERSHED		
Cluff Ranch Pond #3 15040005-0370	15 a	
Coleman Creek From headwaters to Campbell Blue Creek 15040004-040	7.3 mi	
Dix Creek From headwaters to San Francisco River 15040004-1575	2.3 mi	
East Turkey Creek From headwaters to terminus (near San Simon Wash) 15040006-837A	7.8 mi	
Frye Canyon Creek From headwaters to Frye Mesa Reservoir 15040005-988A	5 mi	
North Fork Cave Creek From headwaters to Cave Creek 15040006-856	5.6 mi	
Turkey Creek From headwaters to Campbell Blue Creek 15040004-060	4.6 mi	
VERDE WATERSHED		
Ashbrook Wash From Grande Wash to Verde River 15060202-989 (Previously identified as Grande Wash)	2 mi	(*See* Appendix F)
Beaver Creek From Dry Beaver Creek to Verde River 15060202-002	9.3 mi	
Colony Wash From headwaters to Verde River 15060203-998	4.9 mi	
Dry Creek From headwaters to Oak Creek 15060202-021	22.7 mi	
Granite Creek From headwaters to Willow Creek 15060202-059A	13.4 mi	Dissolved oxygen, *E. coli*, mercury
Horseshoe Reservoir 15060203-0620	1,980 a	Dissolved oxygen
Perkins Lake 15060202-1080	4 a	Low dissolved oxygen
Verde River From Horseshoe Dam to Alder Creek 15060203-008	10.7 mi	
Walnut Creek From Apache Creek to Big Chino Wash 15060201-017	20.1 mi	

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	PLANNING LIST POLLUTANTS OF CONCERN
Watson Lake 15060202-1590	150 a	Nitrogen, low dissolved oxygen, high pH
Wet Beaver Creek From Rarick Creek to Dry Beaver Creek 15060202-003	6.6 mi	
Willow Creek Reservoir 15060202-1660	295 a	High pH

Category 3 -- Inconclusive:

Total # of lakes (*acres*): 32 (*14,689.5*)

Total # of stream reaches (*miles*): 82 (*716.6*)

(**Note**: This is a very incomplete list, as all surface waters that were *not assessed* are also by default in this "inconclusive" category)

Category 4 – Not Attaining (Impaired)

These assessment units are not attaining one or more designated use and are considered impaired for permitting and other regulatory actions. TMDL development is not needed at this time.

4A = TMDL completed and being implemented
4B = Alternative pollutant control requirements
4C = Impairment not caused by a pollutant
4N = Impairment solely due to natural conditions (separate list)

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles / acres)	CAUSES OF IMPAIRMENT	SUB CATEGORY	PLANNING LIST - - EXCEEDANCES
BILL WILLIAMS WATERSHED				
Boulder Creek From Wilder Creek to Butte Creek 15030202-005A	1.4 mi	Arsenic, copper, zinc Beryllium, manganese, low pH	4A 4B	
Boulder Creek From Butte Creek to Copper Creek 15030202-005B	1.6 mi	Arsenic	4A	
COLORADO – GRAND CANYON WATERSHED				
COLORADO – LOWER GILA WATERSHED				
LITTLE COLORADO WATERSHED				
Little Colorado River From West Fork Little Colorado River to Water Canyon Creek 15020001-011	19.8 mi	Sediment/turbidity	4A	
Little Colorado River From Water Canyon Creek to Nutrioso Creek 15020001-010	3.8 mi	Sediment/turbidity	4A	
Little Colorado River From Nutrioso Creek to Carnero Creek 15020001-009	12.1 mi	Sediment/turbidity	4A	
Little Colorado River From unnamed reach to Lyman Lake 15020001-005	3.4 mi	Sediment/turbidity	4A	
Nutrioso Creek From Nelson Reservoir to Picnic Creek 15020001-017B	13.5 mi	Sediment/turbidity	4A	
Nutrioso Creek From Picnic Creek to Little Colorado River 15020001-015	3.5 mi	Sediment/turbidity	4A	
Rainbow Lake 15020005-1170	110 a	Narrative nutrients, low dissolved oxygen, and high pH	4A	
MIDDLE GILA WATERSHED				
Cash Mine Creek From headwaters to Hassayampa River 15070103-349	1 mi	Cadmium, copper, zinc	4A	Lead
Unnamed tributary to Cash Mine Creek From headwaters to Cash Mine Creek 15070103-415	1 mi	Cadmium, copper, zinc	4A	Beryllium, lead, selenium
French Gulch From headwaters to Hassayampa River 15070103-239	9.8 mi	Cadmium, copper, zinc	4A	
Hassayampa River From headwaters to Copper Creek 15070103-007A Also in Category 5 due to low pH	11 mi	Cadmium, copper, zinc	4A	Lead, selenium
Turkey Creek From unnamed tributary to Poland Creek 15070102-036B	21 mi	Copper, lead	Copper and lead	Mercury and suspended sediments

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles / acres)	CAUSES OF IMPAIRMENT	SUB CATEGORY	PLANNING LIST - - EXCEEDANCES
SALT WATERSHED				
Christopher Creek From headwaters to Tonto Creek 15060105-353 Also in Category 5 due to phosphorus	8 mi	*E. coli*	4A	
Gibson Mine Tributary From headwaters to Pinto Creek 15060103-887	1 mi	Copper	4A	
Pinto Creek From headwaters to tributary at 331927/1105456 15060103-018A	2.5 mi	Copper	4A	Low pH
Pinto Creek From tributary at 331927/1105456 to W. Fork Pinto Cr. 15060103-018B	15.3 mi	Copper	4A	Selenium, zinc
Pinto Creek From West Fork Pinto Creek to Roosevelt Lake 15060103-018C Also in Category 5 due to selenium	17.8 mi	Copper	4A	
Tonto Creek From headwaters to tributary at 341810/1110414 15060105-013A Also in Category 5 due to phosphorus and low dissolved oxygen	8.1 mi	Nitrogen, *E. coli*	4A	
Tonto Creek From tributary at 341810/1110414 to Haigler Cr. 15060105-013B	8.5 mi	Nitrogen, *E. coli*	4A	
SAN PEDRO WATERSHED				
SANTA CRUZ WATERSHED				
Alum Gulch From headwaters to 312820/1104351 (beginning of intermittent flow) 15050301-561A	0.8 mi	Cadmium, copper, zinc, low pH	4A	
Alum Gulch From 312820/1104351 to 312917/1104425 (intermittent flow) 15050301-561B	1.1 mi	Cadmium, copper, zinc, low pH	4A	
Arivaca Lake 15050304-0080	118 a	Mercury in fish tissue	4A	
Cox Gulch From headwaters to Three R Canyon 15050301-560	16.3 mi	Cadmium, copper, zinc, low pH	4A	Beryllium
Unnamed trib to Cox Gulch From headwaters to Cox Gulch 15050301-890	1 mi	Cadmium, copper, zinc, low pH	4A	
Harshaw Creek From headwaters to Sonoita Creek 15050301-025	14.4 mi	Copper, low pH	4A	
Unnamed tributary to Harshaw Creek (Endless Chain Mine tributary) 15050301-888	2 mi	Copper, low pH	4A	
Humboldt Canyon From headwaters to Alum Gulch 15050301-340	2 mi	Copper	4A	
Lakeside Lake 15050302-0760	15 a	Ammonia, low dissolved oxygen, high pH	4A	
Pena Blanca Lake 15050301-1070	50 a	Mercury in fish tissue	4A	Low dissolved oxygen, high pH
Three R Canyon From headwaters to 312835/1104619 (where intermittent flow begins) 15050301-558A	2.3 mi	Cadmium, copper, zinc, low pH	4A	

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles / acres)	CAUSES OF IMPAIRMENT	SUB CATEGORY	PLANNING LIST - - EXCEEDANCES
Three R Canyon From 312835/1104619 to 312827/1104712 15050301-558B	1 mi	Cadmium, copper, zinc, low pH	4A	
Three R Canyon From 312827/1104712 to Sonoita Creek 15050301-558C	3 mi	Cadmium, copper, zinc, low pH	4A	
Unnamed tributary to Three R Canyon From headwaters to Three R Canyon 15050301-889	2 mi	Cadmium, copper, zinc, low pH	4A	
UPPER GILA WATERSHED				
Luna Lake 15040004-0840	120 a	Narrative nutrients, low dissolved oxygen, high pH	4A	Lead
VERDE WATERSHED				
Pecks Lake 15060202-1060	95 a	Narrative nutrients, low dissolved oxygen, high pH	4A	
Stoneman Lake 15060202-1490	125 a	Narrative nutrients, low dissolved oxygen, high pH	4A	
Verde River From tributary #15060202-065 to Railroad Draw 15060202-037	10.7 mi	Sediment/turbidity	4A	
Verde River From Sycamore Creek to Oak Creek 15060202-025	25.2 mi	Sediment/turbidity	4A	
Verde River From Oak Creek to Beaver Creek 15060202-015	12.2 mi	Sediment/turbidity	4A	
Verde River From HUC boundary 15060203 to West Clear Cr 15060203-027	6.4 mi	Sediment/turbidity	4A	
Verde River From West Clear Creek to Fossil Creek 15060203-025	23.6 mi	Sediment/turbidity	4A	

Category 4A, 4B, or 4C – Not Attaining (TMDL development is not necessary at this time)**:**
Total # of lakes (*acres*): 7 (*633*)
Total # of stream reaches (*miles*): 35 (*288.1*)

Subcategory 4N = Not Attaining *Solely* Due to Natural Conditions

These waters are not attaining standards solely due to natural conditions (no anthropogenic influences) and are to be protected as Tier 1 surface waters under Antidegradation Rules. Human activities or discharges will not be allowed to provide further loadings of the parameter of concern. (See Antidegradation R18-11-107). The assessment statistics do not include these waters, as this category is not used by EPA or other states. All of these waters are also listed in other categories.

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	CAUSES OF IMPAIRMENT	SUBCATEGORY
BILL WILLIAMS WATERSHED			
COLORADO – GRAND CANYON WATERSHED			
Matkatamiba Creek From headwaters to Colorado River 15010002-935	12.5 mi	Selenium from spring sources	Arizona – 4N
Monument Creek From headwaters to Colorado River 15010002-845	3.5 mi	Selenium from spring sources	Arizona – 4N
Royal Arch Creek From headwaters to Colorado River 15010002-871	5.1 mi	Selenium from spring sources	Arizona – 4N
COLORADO – LOWER GILA WATERSHED			
LITTLE COLORADO WATERSHED			
MIDDLE GILA WATERSHED			
SALT WATERSHED			
Ellis Ranch Tributary From headwaters to Pinto Creek 15060103-888	1 mi	Copper	Arizona – 4N
JK Mountain Tributary From headwaters to West Fork Pinto Creek 15060103-873	1.1 mi	Copper	Arizona – 4N
Mead Canyon From headwaters to Pinto Creek 15060103-889	2.4 mi	Copper	Arizona – 4N
SAN PEDRO WATERSHED			
SANTA CRUZ WATERSHED			
UPPER GILA WATERSHED			
Dankworth Ponds 15040005-0440	8 a	Low dissolved oxygen due to ground water upwelling.	Arizona – 4N
Roper Lake 15040005-1250	25 a	Low dissolved oxygen due to ground water upwelling.	Arizona – 4N
VERDE WATERSHED			
Granite Basin Lake 15060202-0580	7 a	Low dissolved oxygen due to lake turnover.	Arizona – 4N

Category 4N – Not Attaining Solely due to Natural Conditions (TMDL development is not necessary)**:**

Total # of lakes (*acres*): 3 (*40*)

Total # of stream reaches (*miles*): 6 (*25.6*)

Category 5 (ADEQ) – Assessed Impaired by ADEQ

These assessment units are to be on Arizona's 2006/2008 303(d) List, once approved by EPA. TMDL development is scheduled (*see* Appendix C).

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	CAUSES OF IMPAIRMENT	ONGOING TMDL	PLANNING LIST – EXCEEDANCES
BILL WILLIAMS WATERSHED				
Alamo Lake 15030204-0040A	14,150 a	Low dissolved oxygen, high pH, ammonia		
Bill Williams River From Alamo Lake to Castaneda Wash 15030204-003	35.9 mi	Ammonia, low dissolved oxygen, high pH		Lead, suspended sediments
Santa Maria River From Little Sycamore Creek to Little Shipp Wash 15030203-013	6.8 mi	Mercury		Suspended sediments
COLORADO – GRAND CANYON WATERSHED				
Colorado River From Lake Powell to Paria River 14070006-001	16.3 mi	Selenium		
Colorado River From Parashant Canyon to Diamond Creek 15010002-003	27.6 mi	Selenium, suspended sediment		
Paria River From Utah border to Colorado River 14070007-123	29.4 mi	*E. coli*, suspended sediment		Lead, selenium
Virgin River From Beaver Dam Wash to Big Bend Wash 15010010-003	10.1 mi	Selenium, suspended sediment		Boron, *E. coli*
COLORADO – LOWER GILA WATERSHED				
Colorado River From Hoover Dam to Lake Mohave 15030101-015	40.4 mi	Selenium		Low dissolved oxygen
Colorado River From Main Canal to Mexico border 15030107-001	32.2 mi	Low dissolved oxygen, selenium		Mercury, DDE, gammahexachlorocyclohexane
Gila River From Coyote Wash to Fortuna Wash 15070201-003	28.3 mi	Selenium, boron		*E. coli*, low dissolved oxygen
Painted Rock Borrow Pit Lake 15070201-1010	185 a	Low dissolved oxygen		Pesticides
LITTLE COLORADO WATERSHED				
Little Colorado River From Silver Creek to Carr Wash 15020002-004	6.1 mi	Suspended sediment, *E. coli*		Beryllium, barium, lead, and nickel
Little Colorado River From Porter Tank Draw to McDonalds Wash 15020008-017	17.4 mi	Copper, silver, sediment		
MIDDLE GILA WATERSHED				
Alvord Lake 15060106B-0050	27 a	Ammonia		
Chaparral Park Lake 15060106B-0300	12 a	Low dissolved oxygen, *E. coli*		
Cortez Park Lake 15060106B-0410	2 a	Low dissolved oxygen, high pH		
Gila River From San Pedro River to Mineral Creek 15050100-008	19.8 mi	Suspended sediment		
Gila River From Centennial Wash to Gillespie Dam 15070101-008	5.3 mi	Selenium, boron		DDT, toxaphene, chlordane

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	CAUSES OF IMPAIRMENT	ONGOING TMDL	PLANNING LIST -- EXCEEDANCES
Hassayampa Creek From headwaters to Copper Creek 15070103-007A	11.0 mi	Low pH		Selenium, lead
Mineral Creek From Devil's Canyon to Gila River 15050100-012B	19.6 mi	Copper, selenium, low dissolved oxygen		
Queen Creek From headwaters to mining WWTP discharge 15050100-014A	8.8 mi	Copper	Copper	
Queen Creek From mining WWTP discharge to Potts Canyon 15050100-014B	5.9 mi	Copper	Copper	Chlorine, dissolved oxygen, selenium
SALT WATERSHED				
Apache Lake 15060106A-0070	2190 a	Low dissolved oxygen		
Canyon Lake 15060106A-0250	450 a	Low dissolved oxygen		
Christopher Creek From headwaters to Tonto Creek 15060105-353	8.0 mi	Phosphorus		
Five Point Tributary From headwaters to Pinto Creek 15060103-885	2.9 mi	Copper	Copper	
Pinto Creek From West Fork Pinto Creek to Roosevelt Lake 15060103-018C	17.8 mi	Selenium	Copper	
Salt River From Pinal Creek to Roosevelt Lake 15060106A-004	7.5 mi	Suspended sediment		Cyanide, dissolved oxygen, *E. coli*, lead, selenium
Salt River From Stewart Mountain Dam to Verde River 15060106A-003	10.1 mi	Low dissolved oxygen		*E. coli*
Tonto Creek From headwaters to unnamed tributary 15060105-013A	8.1 mi	Phosphorus, low dissolved oxygen		
SAN PEDRO WATERSHED				
Brewery Gulch From headwaters to Mule Gulch 15080301-337	1 mi	Copper	Copper	Lead, low pH
Mule Gulch From headwaters to above Lavender Pit 15080301-090A	3 mi	Copper	Copper	Cadmium
Mule Gulch From above Lavender Pit to Bisbee WWTP discharge 15080301-090B	0.8 mi	Copper	Copper	Lead
Mule Gulch From Bisbee WWTP discharge to Highway 80 bridge 15080301-090C	3.8 mi	Cadmium, copper, low pH, zinc	Copper, low pH, zinc	Lead
San Pedro River From Babocomari Creek to Dragoon Wash 15050202-003	17 mi	*E. coli*	*E. coli*	
San Pedro River From Dragoon Wash to Tres Alamos Wash 15050202-002	15.5 mi	Nitrate		*E. coli*, lead, mercury, SSC
San Pedro River From Aravaipa Creek to Gila River 15050203-001	14.8 mi	Selenium, *E. coli*	*E. coli*, selenium	
SANTA CRUZ WATERSHED				
Nogales Wash From Mexico border to Potrero Creek 15050301-011	6.2 mi	Copper, ammonia, *E. coli*, chlorine		Dissolved oxygen

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	CAUSES OF IMPAIRMENT	ONGOING TMDL	PLANNING LIST – EXCEEDANCES
Santa Cruz River From Mexico border to Nogales WWTP 15050301-010	17 mi	*E. coli*		
Sonoita Creek From 750 feet below Patagonia WWTP discharge to Patagonia Lake 15050301-013C	9.03 mi	Zinc, low dissolved oxygen		
UPPER GILA WATERSHED				
Blue River From Strayhorse Creek to San Francisco River 15040004-025B	25.4 mi	*E. coli*		Suspended sediments
Cave Creek From headwaters to South Fork Cave Creek 15040006-852A	7.5 mi	Selenium		
Gila River From New Mexico border to Bitter Creek 15040002-004	16.3 mi	Suspended sediment, *E. coli*		Copper
Gila River From Skully Creek to San Francisco River 15040002-001	15.2 mi	Selenium		Copper, suspended sediments
Gila River From Bonita Creek to Yuma Wash 15040005-022	5.8 mi	*E. coli*		Suspended sediment
San Francisco River From Blue River to Limestone Gulch 15040004-003	18.7 mi	*E. coli*		Mercury
VERDE WATERSHED				
East Verde River From Ellison Creek to American Gulch 15060203-022B	20.3 mi	Selenium		
East Verde River From American Gulch to Verde River 15060203-022C	25.8 mi	Arsenic, boron		*E. coli*
Oak Creek From headwaters to West Fork Oak Creek 15060202-019	7.4 mi	*E. coli*	*E. coli*	
Oak Creek From West Fork Oak Creek to tributary at 345709/1114513 15060202-018A	5 mi	*E. coli*	*E. coli*	
Oak Creek From tributary at 345709/1114513 to downstream boundary of Slide Rock State Park 15060202-018B	1 mi	*E. coli*	*E. coli*	
Oak Creek From Slide Rock State Park to Dry Creek 15060202-018C	20.0 mi	*E. coli*	*E. coli*	
Oak Creek From Dry Creek to Spring Creek 15060202-017	10 mi	*E. coli*	*E. coli*	
Spring Creek From Coffee Creek to Oak Creek 15060202-022	6.4 mi	*E. coli*	*E. coli*	

Category 5 – Impaired (require TMDL development)**:**

Total # of lakes (*acres*): 7 (*17,016*)

Total # of stream reaches (*miles*): 48 (*648.3*)

Category 5 (EPA) – Assessed Impaired by EPA

These assessment units were assessed as impaired by EPA in 2002 or 2004. They remain on Arizona's list of impaired waters until EPA determines that they are no longer impaired.

SURFACE WATER	REACH OR LAKE NUMBER	POLLUTANTS OR PARAMETERS OF CONCERN
Bill Williams Watershed		
Alamo Lake	15030204-0040	Mercury in fish tissue
Boulder Creek From unnamed wash at 34°41'14"/113°03'34" to Wilder Creek	15030202-006B	Mercury
Boulder Creek From Wilder Creek to Butte Creek	15030202-005A	Mercury
Burro Creek From Boulder Creek to Black Canyon Creek	15030202-004	Mercury
Coors Lake	15030202-5000	Mercury in fish tissue
Colorado - Grand Canyon Watershed		
Colorado – Lower Gila Watershed		
Painted Rock Borrow Pit Lake	15070201-1010	DDT metabolites, toxaphene and chlordane in fish tissue
Little Colorado – San Juan Watershed		
Bear Canyon Lake	15020008-0130	Low pH
Lake Mary (lower)	15020015-0890	Mercury in fish tissue
Lake Mary (upper)	15020015-0900	Mercury in fish tissue
Little Colorado River From Silver Creek to Carr Wash	15020002-004	Sediment
Long Lake (lower)	15020008-0820	Mercury in fish tissue
Lyman Lake	15020001-0850	Mercury in fish tissue
Soldier's Annex Lake	15020008-1430	Mercury in fish tissue
Soldier's Lake	15020008-1440	Mercury in fish tissue
Middle Gila Watershed		
Gila River Salt River - Agua Fria River	15070101-015	DDT metabolites, toxaphene and chlordane in fish tissue
Gila River Agua Fria River - Waterman Wash	15070101-014	DDT metabolites, toxaphene and chlordane in fish tissue
Gila River Waterman Wash - Hassayampa River	15070101-010	DDT metabolites, toxaphene and chlordane in fish tissue
Gila River Hassayampa River - Centennial Wash	15070101-009	DDT metabolites, toxaphene and chlordane in fish tissue
Gila River Centennial Wash - Gillespie Dam	15070101-008	DDT metabolites, toxaphene and chlordane in fish tissue
Gila River Gillespie Dam - Rainbow Wash	15070101-007	DDT metabolites, toxaphene and chlordane in fish tissue
Gila River Rainbow Wash - Sand Tank	15070101-005	DDT metabolites, toxaphene and chlordane in fish tissue
Gila River Sand Tank - Painted Rocks Reservoir	15070101-001	DDT metabolites, toxaphene and chlordane in fish tissue
Hassayampa River Buckeye Canal – Gila River	15070103-001B	DDT metabolites, toxaphene and chlordane in fish tissue
Painted Rocks Reservoir	15070101-1020A	DDT metabolites, toxaphene and chlordane in fish tissue

SURFACE WATER	REACH OR LAKE NUMBER	POLLUTANTS OR PARAMETERS OF CONCERN
Salt River 23rd Ave WWTP - Gila River	15060106B-001D	DDT metabolites, toxaphene and chlordane in fish tissue
Salt River Watershed		
Crescent Lake	15060101-0420	High pH
Tonto Creek From headwaters to unnamed tributary	15060105-013A	Low dissolved oxygen
San Pedro – Willcox Playa – Rio Yaqui Watershed		
Brewery Gulch From headwaters to Mule Gulch	15080301-337	Copper
Mule Gulch From above Lavender Pit to Bisbee WWTP	15080301-090B	Low pH
Santa Cruz – Rio Magdalena – Rio Sonoyta Watershed		
Parker Canyon Lake	15050301-1040	Mercury in fish tissue
Rose Canyon Lake	15050302-1260	Low pH
Upper Gila Watershed		
Gila River From Bonita Creek to Yuma Wash	15040005-022	Sediment
San Francisco River From headwaters to New Mexico Border	15040004-023	Sediment
Verde Watershed		
Granite Creek From headwaters to Willow Creek	15060202-059A	Low dissolved oxygen
Watson Lake	15060202-1590	Nitrogen, low dissolved oxygen, high pH
Whitehorse Lake	15060202-1630	Low dissolved oxygen

Appendix C

APPENDIX C
ADEQ TMDL PRIORITY RANKING AND SCHEDULE

ASSESSMENT UNIT	POLLUTANT (YEAR LISTED)	DISCUSSION	PRIORITY RANKING	TMDL SCHEDULE
Bill Williams Watershed				
Alamo Lake 15030204-0040 1,414 acres	Ammonia (2004), High pH (1996) Low dissolved oxygen (2006)	Low dissolved oxygen, ammonia, and high pH be symptoms of narrative nutrient violations, and may indicate that toxic conditions are occurring for lake aquatic life. New narrative nutrient implementation procedures have been drafted, and once adopted should be applied to this lake. Ongoing monitoring by the US Fish and Wildlife Service (contracted by the US Army Corps of Engineers) should provide data needed to support TMDL development.	Medium	To initiate in 2010. To complete in 2012.
Bill Williams River From Alamo Lake to Castaneda Wash 15030204-003 35.9 miles	Ammonia, low dissolved oxygen, high pH (2006)	Ammonia is considered toxic to aquatic life and low dissolved oxygen and high pH may pose further stresses on the aquatic community. These stressors are generally associated with excess nutrients. To coordinate with Alamo Lake TMDL development as this reach receives the discharge from Alamo Lake, and is therefore, the probable source of the water quality problems.	Medium	To initiate in 2020. To complete in 2012.
Santa Maria River From Little Sycamore Creek to Little Shipp Wash 15030203-013 6.8 miles	Mercury (2006)	Water in the Santa Maria River flows to Lake Alamo, which has a fish consumption advisory for mercury. This drainage receives runoff from historic mining sites. Mercury loadings to these reaches should be addressed in the Alamo Lake mercury TMDL currently being developed. Therefore, development of a separate mercury TMDL for these reaches is a low priority.	Low	To initiate in 2011. To complete in 2013.
Colorado-Grand Canyon Watershed				
Colorado River From Lake Powell to Paria River 14070006-001 16 miles	Selenium (2006)	This TMDL will be complex due to the size of the drainage area, natural background in this geology, and contributions from other states and Indian lands. The two federally protected species occur in this area (humpback chub and razorback sucker) should not be negatively impacted by this concentration of selenium. ADEQ will coordinate development of selenium TMDLs along the Colorado.	Low	To initiate in 2010. To complete in 2012.
Colorado River From Parashant Canyon to Diamond Creek 15010002-003 28 miles	Selenium (2004), Suspended Sediment Concentration (2004)	Development of this TMDL will be complex due to the size of the drainage area, natural background in this sandstone geology, and contributions from other states and Indian lands. Two federally protected species occur in this area (humpback chub and razorback sucker), but they should not be negatively impacted by the suspended sediment or this concentration of selenium. Dates chosen reflect that ADEQ will be coordinating development of selenium TMDLs along the Colorado River.	Low	To initiate in 2010. To complete in 2012.
Paria River From Utah border to Colorado River 14070007-123 29 miles	Suspended Sediment Concentration (2004)	Prior monitoring and investigations in this drainage should help support TMDL development; however, further investigation is needed to determine source loadings, especially contributions from natural background in this sandstone geology. Source contributions from Utah may also make this TMDL more complex. Dates chosen reflect that ADEQ will coordinate development of both TMDLs.	Low	To initiate in 2010. To complete by 2012.
	E. coli (2006)	Exceedances of *Escherichia coli* criteria may represent a significant public health concern if people are swimming or even wading in the water; however, this is a relatively remote canyon, with light recreational use. This TMDL is complex due to source contributions from Utah.	Medium	To initiate in 2010 To complete in 2012.

ASSESSMENT UNIT	POLLUTANT (YEAR LISTED)	DISCUSSION	PRIORITY RANKING	TMDL SCHEDULE
Virgin River From Beaver Dam Wash to Bend Wash 15010010-003 10 miles	Selenium (2004), Suspended sediment (2004)	Further investigation is needed to determine selenium source loadings. Ongoing monitoring by the U.S. Geological Survey. Determining contributions from Utah and from natural background in this sandstone geology will make developing both TMDLs more complex. Federally protected Virgin River chum and woundfin occur in this area but should not be negatively impacted by this concentration of selenium or suspended sediment. Dates chosen reflect that ADEQ will be coordinating development of selenium TMDLs along the Colorado River, including the Virgin River.	Low	To initiate in 2011. To complete in 2012.
Colorado-Lower Gila Watershed				
Colorado River From Hoover Dam to Lake Mohave 15030101-015 40 miles	Selenium (2004)	The federally protected Yuma clapper rail occurs in this area and could be negatively impacted by elevated levels of selenium as it bioaccumulates in prey species. Long-term monitoring by U.S. Geological Survey should support TMDL development; however, the TMDL will be complex due to contributions from natural sources and other states. Dates chosen reflect that ADEQ will be coordinating development of selenium TMDLs along the Colorado River.	High	To initiate in 2010. To complete in 2012.
Colorado River From Main Canal to Mexico border 15030107-001 32 miles	Selenium (2006)	The federally protected Yuma clapper rail occurs in this area and could be negatively impacted by elevated levels of selenium as it bioaccumulates in prey species. These TMDLs may be complicated by the large number of potential sources as the Colorado River drainage area covers many states in the Southwest. Dates chosen reflect that ADEQ will be coordinating development of selenium TMDLs along the Colorado River.	High	To initiate in 2010. To complete in 2012.
	Low dissolved oxygen (2006)	Low dissolved oxygen may be a symptom of excess nutrient loadings, and may be stressful to aquatic life. These TMDLs may be complicated by the large number of potential sources as the Colorado River drainage area covers many states in the Southwest. Dates chosen reflect that ADEQ will coordinate development of both TMDLs in this reach.	Low	To initiate in 2010. To complete in 2012.
Gila River From Coyote Wash to Fortuna Wash 15070201-003 28 miles	Boron and selenium (2004)	The federally protected Yuma clapper rail occurs in this area and could be negatively impacted by elevated levels of selenium as it bioaccumulates in prey species. Boron may impact downstream agricultural uses, but present a low ecological and human health risk. Both elevated selenium and boron may be associated with the extensive irrigated agriculture in the greater Yuma area. To coordinate the boron investigation with TMDL development upstream at Gillespie Dam and the selenium TMDL development with work on the Colorado River.	High	To initiate in 2009. To complete in 2011.
Painted Rocks Borrow Pit Lake 15070201-1010 180 acres	Low dissolved oxygen (1992)	A diagnostic feasibility study by ADEQ in 1992 concluded that the design and maintenance of this shallow lake was the primary cause of the low dissolved oxygen. Drought conditions have left the lake dry during most of the past five years. The lake is no longer stocked with fish and does not have recreational uses because of the pesticide contamination (see below).	Low	TMDL will be initiated when the lake refills and representative samples can be collected.
Little Colorado Watershed				
Little Colorado River From Silver Creek to Carr Wash 15020002-004 6 miles	*E. coli* (2004)	Exceedances of *Escherichia coli* criteria may represent a significant public health concern if people are swimming or even wading in the water. Exceedances may be related to wet weather events. The drainage is more than 8,000 square miles, so determining the source of contamination may be complex. Substantial monitoring data is needed to identify sources.	High	To initiate in 2007. To complete in 2009.

ASSESSMENT UNIT	POLLUTANT (YEAR LISTED)	DISCUSSION	PRIORITY RANKING	TMDL SCHEDULE
	Suspended sediment (2006)	Sediment may pose a threat to aquatic life. The drainage is more than 8,000 square miles, so determining the source of contamination may be complex. Substantial monitoring data is needed to identify sources. Dates reflect that both TMDLs will be developed at the same time.	Medium	To initiate in 2007. To complete in 2009.
Little Colorado River From Porter Tank Draw to McDonalds Wash 15020008-017 17 miles	Copper and silver (1992)	Copper and silver concentrations may be toxic to aquatic life. Little Colorado spine dace, a federally protected species, occurs in this reach and may be negatively impacted by the copper and silver. Data from a USGS study concluded that the metals may be naturally elevated; however, sources and natural background concentrations need to be further studied. The nature of these pollutants also makes this study complex.	High	To initiate in 2007. To complete in 2009.
	Suspended sediment (2004)	Little Colorado spine dace, a federally protected species, occurs in this reach but should not be negatively impacted by the suspended sediment concentration. This TMDL is complex due to the size of the drainage area. Dates reflect that both TMDLs will be developed at the same time.	Medium	To initiate in 2007. To complete in 2009.
Middle Gila Watershed				
Alvord Park Lake 15060106B-0050 27 acres	Ammonia (2004)	Ammonia poses a significant threat to aquatic life due to its toxic nature. This lake is an important urban recreational area. More investigation is needed to determine the source of the pollutants.	High	To initiate in 2007. To complete in 2009.
Chaparral Lake 15060106B-0300 13 acres	Low dissolved oxygen (2004)	Narrative nutrient implementation guidance, when adopted, will be used to determine if the low dissolved oxygen is related to excess nutrients in the lake. Excess nutrient loads and low dissolved oxygen can stress aquatic life and would be detrimental to this important urban recreational area. Investigation and monitoring is needed to identify sources. Dates reflect that nutrient TMDL development will be coordinated at Phoenix metropolitan area lakes.	Medium	To initiate in 2007. To complete in 2009.
	E. coli (2004)	Although exceedances of *E. coli* bacteria represent a risk to public health, swimming or wading in the lake are prohibited. However, this is an important recreational area. Dates reflect that TMDL development will be coordinated.	Medium	To initiate in 2007. To complete in 2009.
Cortez Park Lake 15060106B-0410	Low dissolved oxygen and high pH (2004)	Narrative nutrient implementation guidance, when adopted, will be used to determine if the low dissolved oxygen and high pH is related to excess nutrients in the lake. Excess nutrient loads are stressful to aquatic life and would be detrimental to this important urban recreational area. Dates reflect that nutrient TMDL development will be coordinated at Phoenix metropolitan area lakes.	Medium	To initiate in 2007. To complete in 2009.
Gila River From San Pedro River to Mineral Creek 15050100-008 19.8 miles	Suspended sediment (2006)	Sediment may pose a threat to aquatic life. Extensive monitoring will be needed to determine sources. TMDL may be complex due to the size of the watershed. Coordinate development of this TMDL with other suspended sediment TMDLs on the Gila River (see Upper Gila Watershed).	Low	To initiate 2009. To complete 2011.
Gila River From Centennial Wash to Gillespie Dam 15070101-008 5 miles	Boron (1992) selenium (2004)	The federally protected Yuma clapper rail and Southwest willow flycatcher have been found in this area and could be negatively impacted by elevated selenium. Elevated boron can reduce crop production. Both pollutants may be associated with the extensive agriculture in the area; however, TMDL may be complex due to the large number of potential sources and seasonal influences. ADEQ will coordinate with boron and selenium TMDLs downstream on Gila River near Dome.	High	To initiate in 2009. To complete in 2011.

ASSESSMENT UNIT	POLLUTANT (YEAR LISTED)	DISCUSSION	PRIORITY RANKING	TMDL SCHEDULE
Hassayampa River From headwaters to Copper Creek 15070103-007A	Low pH (2006)	Cadmium, copper, and zinc TMDLs were completed in 2002. Actions to reduce metal loads will also address the low pH; therefore, development of a pH TMDL is a low priority.	Low	Initiate in 2012. To complete in 2014.
Mineral Creek From Devils Canyon to Gila River 15050100-012B	Selenium (2004)	Mining operation has been collecting samples to determine sources of selenium and causes of low dissolved oxygen. Mine will be submitting plans and initiating actions to mitigate increases in selenium concentrations within the diversion tunnel. When submitted, ADEQ will to move this to category 4B.	Medium	Terms of consent decree should negate need for TMDL.
	Low dissolved oxygen (2006)	Low dissolved oxygen may be due to surface water diversion around mining operation. Will coordinate TMDL with development of the selenium TMDL.	Low	To initiate in 2007. To complete in 2009.
Queen Creek From headwaters to Potts Canyon 15050100-014A and 15050100-014B 15 miles (total)	Copper (2002 one reach, 2004 second reach)	TMDL in progress. Copper poses a risk to aquatic life and wildlife. The TMDL is being developed and should be completed in 2007.	Medium	Initiated in 2004. To complete in 2009.
Salt Watershed				
Christopher Creek From headwaters to Tonto Creek 15060105-353	Phosphorus (2006)	*E. coli* bacteria TMDLs were completed in 2004. Actions to reduce *E. coli* bacteria loadings will also reduce phosphorus loadings; therefore, development of a phosphorus TMDL is a low priority. Will coordinate with Tonto Creek TMDLs.	Low	To initiate in 2008. To complete in 2010.
Low dissolved oxygen in Salt River and its reservoirs 1. Apache Lake 15060106A-0070 2. Canyon Lake 15060106A-0250 3. Salt River From Stewart Mountain Dam to Verde River 15060106A-003 10 miles 2347 acres (total)	Low dissolved oxygen (2004 – Canyon Lake and Salt River) (2006 – Apache Lake)	Low dissolved oxygen can be a symptom of excess nutrient loads. Such loadings can be stressful to aquatic life and even lead to fish kills, which would be detrimental to this important recreational area. The federally protected Yuma clapper rail and bald eagle in this area should not be negatively impacted by the low dissolved oxygen. Narrative nutrient implementation guidance, when adopted, will be used to determine if the low dissolved oxygen is related to excess nutrients in the lake. ADEQ intends changed the designated use from A&Wc to A&Ww during the current Triennial Review of surface water quality standards, which will reduce the number of exceedances. However, low dissolved oxygen will still not be sufficient during several monitoring events. ADEQ intends to coordinate development of TMDLs within the Salt River chain of reservoirs.	Medium	To initiate in 2010. To complete in 2012.
Five Point Mountain Tributary From headwaters to Pinto Creek 15060103-885 2.9 miles	Copper (2006)	Site specific criteria are currently being developed in support of a Phase II Copper TMDL. The federally protected Colorado pikeminnow occurs in this area and could be negatively impacted by the copper. There is wide public support for development of TMDLs in Pinto Creek.	High	Initiated in 2004. To complete TMDL once site specific criteria are adopted (2006). Phase II copper TMDL to be completed in 2009.
Pinto Creek From West Fork Pinto Creek to Roosevelt Lake 15060103-018C 17.8 miles	Selenium (2004)	The federally protected Colorado pikeminnow and bald eagle both occur in this area and could be negatively impacted by the selenium. There is wide public support for development of TMDLs in Pinto Creek. Monitoring to support the Phase II copper TMDL should also be useful in completing the selenium TMDL.	High	To initiate in 2009. To complete in 2011.
Salt River From Pinal Creek to Roosevelt Dam 15060103-004 7.5 miles	Suspended sediment (2006)	Chronically elevated suspended sediment can have negative impacts on aquatic life, especially during critical periods of reproduction. Sediment may be transporting pollutants into Roosevelt Lake, an important reservoir and recreational area.	Medium	To initiate in 2010. To complete in 2012.
Tonto Creek From headwaters to unnamed tributary 15060105-013A 8.1 miles	Phosphorus, dissolved oxygen (2006)	Nitrogen and *E. coli* bacteria TMDLs were completed in 2004. Actions to reduce nitrogen and *E. coli* bacteria loadings will also reduce phosphorus loadings and increase dissolved oxygen; therefore, development of the dissolved oxygen and phosphorus TMDLs are a low priority. Will coordinate with Christopher Creek TMDL.	Low	To initiate in 2008. To complete in 2010.

ASSESSMENT UNIT	POLLUTANT (YEAR LISTED)	DISCUSSION	PRIORITY RANKING	TMDL SCHEDULE
San Pedro Watershed				
Brewery Gulch From headwaters to Mule Gulch 15080301-337 1 mile	Copper (2004)	Part of Mule Gulch TMDL (see below)		
Mule Gulch From headwaters to Lavender Pit 15080301-090A 3 miles	Copper (1990)	Part of Mule Gulch TMDL (see below)		
Mule Gulch Lavender Pit to Bisbee WWTP discharge 15080301-090B 0.8 miles	Copper (1990)	Part of Mule Gulch TMDL (see below)		
Mule Gulch From Bisbee WWTP discharge to Highway 80 bridge 15080301- 090C 3.8 miles	Copper, cadmium, zinc, and low pH (1990)	Currently establishing site-specific criteria in support of a TMDL. This metal contamination represents a significant threat to wildlife and human health due to the magnitude and frequency of the Exceedances. This TMDL involves a large and heavily impacted mining area, where site-specific standards need to be developed before the TMDL can be completed. Long term drought conditions have increased the difficulty collecting samples to identify sources and to model loadings.	Medium	Initiated in 2000. To complete TMDL after site specific criteria are established (2009).
San Pedro River From Babocomari Creek to Dragoon Wash 15050202-003 17 miles	*E. coli* (2004)	Exceedances of *Escherichia coli* bacteria criteria may represent a public health concern if people are swimming or even wading in the water. The TMDL may be complicated due to the size of the watershed and drainage from Mexico. Monitoring will be coordinated with other TMDLs along the San Pedro.	High	Initiated in 2006. To complete in 2009.
San Pedro River From Dragoon Wash to Tres Alamos Wash 15050202-002 16 miles	Nitrate (1990)	ADEQ's WQARF (superfund cleanup) Program is working with this site. The facility has instituted several actions to bring the surface and ground water into compliance with its standards and is conduction monitoring at several sites along the San Pedro River. Although surface water quality is improving, cleanup will take time a there is significant contamination of ground water, which seeps into the San Pedro.	Low	Ongoing Superfund remediation and monitoring. Will initiate TMDL if WQARF cleanup is not effective.
San Pedro River From Aravaipa Creek to Gila River 15050203-001 14.8 miles	*E. coli* (2004)	Exceedances of *Escherichia coli* bacteria criteria may represent a public health concern if people are swimming or even wading in the water. The large drainage area may make identifying sources more difficult. Monitoring will be coordinated with other TMDLs in the San Pedro.	High	Initiated in 2006 To complete in 2009.
	Selenium (2004)	The federally protected bald eagle and Southwest willow flycatcher found in this area may be negatively impacted by the elevated selenium. The large drainage area may make identifying sources more difficult. Monitoring will be coordinated with other TMDLs in the San Pedro.	High	Initiated in 2006. To complete in 2009.
Santa Cruz Watershed				

ASSESSMENT UNIT	POLLUTANT (YEAR LISTED)	DISCUSSION	PRIORITY RANKING	TMDL SCHEDULE
Nogales Wash 15050301-011 6 miles	Ammonia (2004), chlorine (1996), Copper (2004), *E. coli* (1998)	Exceedances of *Escherichia coli* bacteria criteria may represent a public health concern if people are swimming or even wading in the water. Ammonia, chlorine, copper, and low dissolved oxygen are significant threats to aquatic life. The Friends of the Santa Cruz is interested in obtaining high quality water in the Santa Cruz River and Nogales Wash area. Sources are known – deteriorated infrastructure in Mexico that sends raw sewage into Arizona. Implementing corrective actions requires funding and is dependent on international negotiations. Chlorine is added to the raw sewage due to human health concerns. TMDLs will be developed if needed after facility upgrades are complete.	Low	Initiated in 2008. To complete by 2010.
Santa Cruz River Mexico border – Nogales WWTP 15050301-010 17 miles	*E. coli* (2002)	Exceedances of *Escherichia coli* bacteria criteria may represent a public health concern if people are swimming or even wading in the water. The Friends of the Santa Cruz is interested in maintaining high quality water in the Santa Cruz River and Nogales Wash area. Several years of drought has interfered with collecting samples to determine source loadings. TMDL may be more complex because sources contributions may be in Mexico.	High	Initiated in 2008. To complete by 2010.
Sonoita Creek From 750 feet below WWTP to Patagonia Lake 15050301-013C 9.03 miles	Zinc (2004)	The federally protected Gila topminnow occurs in this reach and could be negatively impacted by dissolved zinc. Source of zinc has not been investigated; however, zinc is impairing both Alum Wash and Three R Canyon, which are tributaries located upstream (TMDLs completed on those tributaries in 2003).	High	To initiate in 2006. To complete in 2009.
	Low dissolved oxygen (1998)	The federally protected Gila topminnow occurs in this reach and could be negatively impacted by low dissolved oxygen. The low dissolved oxygen occurs immediately below the Patagonia WWTP discharge and in an area of ground water upwelling.	High	To initiate in 2006. To complete in 2009.
Upper Gila Watershed				
Blue River From Strayhorse Creek to San Francisco River 15040004-025B 25.4 Miles	*E. coli* (2006)	Exceedances of *Escherichia coli* bacteria criteria may represent a public health concern if people are swimming or even wading in the water. Monitoring is needed to determine sources of bacterial contamination. The Gila Watershed Partnership is interested in maintaining high quality water in the Gila River and its tributaries.	High	To initiate in 2009. To complete in 2011.
Cave Creek From headwaters to South Fork of Cave Creek 15040006-852A 8 miles	Selenium (2004)	Selenium may be toxic to aquatic life or species that feed on them. This stream is classified as a "unique water." The Gila Watershed Partnership is interested in maintaining high quality water in the Gila River and its tributaries. Initial investigations and monitoring indicates that sources are likely natural; therefore, TMDL development has a lower priority.	Medium	Initiated in 2006. To complete in 2009.
Gila River From New Mexico border to Bitter Creek 15040002-004 16.3 miles	*E. coli* (2006)	Exceedances of *Escherichia coli* bacteria criteria may represent a public health concern if people are swimming or even wading in the water. The Gila Watershed Partnership is interested in maintaining high quality water in the Gila River and its tributaries. The TMDL is complex due to the size of the watershed (nearly 8,000 square miles extending into New Mexico).	High	To initiate in 2006. To complete in 2009.
	Suspended sediment (2006)	Suspended sediment may pose a risk to aquatic life. The Gila Watershed Partnership is interested in maintaining high quality water in the Gila River and its tributaries. The TMDL is complex due to the size of the watershed that extends into New Mexico (nearly 8,000 square miles). TMDL development along the Gila River will be coordinated.	Low	To initiate in 2006. To complete in 2009.

ASSESSMENT UNIT	POLLUTANT (YEAR LISTED)	DISCUSSION	PRIORITY RANKING	TMDL SCHEDULE
Gila River From Skully Creek to San Francisco River 15040002-001 15 miles	Selenium (2004)	Selenium may be toxic to aquatic life or species that feed on them. The selenium is only slightly over the water quality criteria, so may not negatively impact the federally protected spikedace and loach minnow that occur in this area. The Gila Watershed Partnership is interested in maintaining high quality water in the Gila River and its tributaries. The TMDL is complex due to the size of the watershed that extends into New Mexico (nearly 8,000 square miles). Dates reflect that TMDL development along the Gila River will be coordinated.	Medium	To initiate in 2006 To complete in 2009.
Gila River From Bonita Creek to Yuma Wash 15040005-022 6 miles	*E. coli* bacteria (2004)	Exceedances of *Escherichia coli* bacteria criteria may represent a public health concern if people are swimming or even wading in the water. The Gila Watershed Partnership is interested in maintaining high quality water in the Gila River and its tributaries. The TMDLs are complex due to the size of the watershed that extends into New Mexico (nearly 8,000 square miles).	High	To initiate in 2006. To complete in 2009.
San Francisco River From Blue River to Limestone Gulch 15040004-003 18.7 miles	*E. coli* (2006)	Exceedances of *Escherichia coli* bacteria criteria may represent a public health concern if people are swimming or even wading in the water. The Gila Watershed Partnership is interested in maintaining high quality water in the Gila River and its tributaries.	High	To initiate in 2009. To complete in 2011.
Verde Watershed				
East Verde River From Ellison Creek to American Gulch 15060203-022B 20 miles	Selenium (2004)	Selenium may be toxic to aquatic life or species that feed on them. Monitoring is needed to determine source loadings and contribution from natural sources. The selenium is only slightly over the water quality criteria, so it is not known whether federally protected Gila trout occurs in this area will be negatively impacted by the elevated selenium.	Low	To initiate in 2009. To complete in 2011.
East Verde River From American Gulch to Verde River 15060203-022C 26 miles	Arsenic and boron (2006)	Arsenic and boron may present public health risks to people using this segment as a drinking water source or for swimming. This segment is near Payson, Arizona, and provides important recreational opportunities.	High	To initiate in 2009. To complete in 2011.
Bacteria TMDL 1. Oak Creek From headwaters to Spring Creek 15060202-019, -018A, -018B, -018C, 017 2. Spring Creek From headwaters to Oak Creek 15060202-022 50 miles (total)	*E. coli* bacteria (1992 – 018B) (2006 – the other segments)	Exceedances of *Escherichia coli* bacteria criteria may represent a public health concern if people are swimming or even wading in the water. Monitoring during the ongoing Phase II *E. coli* TMDL has shown that bacteria contamination occurs in more reaches of Oak Creek and some of its tributaries. Complex TMDL due to potential sources within the watershed, heavy recreational use during summer holidays, and natural bacterial contamination during runoff events.	High	Initiated Phase II E. coli TMDL in 2004 To complete in 2009.

EPA TMDL Schedule and Priority Ranking

ASSESSMENT UNIT	POLLUTANT (YEAR LISTED)	DISCUSSION	PRIORITY RANKING AND SCHEDULE
Bill Williams Watershed			
Alamo Lake 15030204-0040 1,414 acres	Mercury (in fish tissue) (2002)	A mercury fish consumption advisory was issued in 2004. Fish in this lake are also a food source for the bald eagle, a federally listed as Threatened species. The lake supports significant sport fishing. A mercury TMDL was initiated in 2004 and is expected to be approved in 2006. ADEQ is currently collecting atmospheric deposition data for mercury.	High. Initiated in 2004. To complete in 2009.
Boulder Creek From unnamed tributary to Wilder Creek 15030202-006B 14.4 miles Boulder Creek From Wilder Creek to Butte Creek 15030202-005A 1.4 miles Burro Creek From Boulder Creek to Black Canyon Creek 15030202-004 17.2 miles	Mercury (2004)	Although fishing is unlikely due to the intermittent nature of this low desert stream, water in Boulder Creek flows to Lake Alamo, which has a fish consumption advisory for mercury. Mercury loadings from the Burro Creek/Boulder Creek area will be addressed in the Alamo Lake mercury TMDL currently being developed. Remediation actions on tailings piles along Boulder Creek should help reduce mercury loadings. Therefore, development of a mercury TMDL here is a lower priority.	Low. Initiate in 2011. Complete in 2013.
Coors Lake 15030202-5000 230 acres	Mercury (2004)	Coors Lake is on Butte Creek, a tributary to Boulder Creek (listed above). A fish consumption advisory due to mercury contamination was issued in 2004. Low priority ranking is contingent on restricting fishing at this privately owned lake.	Low. Initiate in 2011. Complete in 2013.
Colorado-Grand Canyon Watershed			
Colorado-Lower Gila Watershed			
Painted Rocks Borrow Pit Lake 15070201-1010 180 acres	DDT metabolites, toxaphene, chlordane in fish tissue (2002)	(See discussion and schedule in Middle Gila – Painted Rocks Pesticide Contamination) TMDL will be coordinated with pesticide TMDLs in the Middle Gila.	High.
Little Colorado Watershed			
Bear Canyon Lake 15020008-0130 55 acres	pH (2004)	This is an important fishing and recreational area. High pH may be a symptom of narrative nutrient violations and may stress aquatic life in the lake. Narrative nutrient implementation guidance, when adopted, will be used to determine if high pH values are related to excess nutrients. Investigation and monitoring is needed to identify sources.	Medium. Initiate in 2009, To complete in 2011.
Regional mercury TMDL 1. Lake Mary, Upper 15020015-0900 2. Lake Mary, Lower 15020015-0890 3. Long Lake 15020008-0820 4. Soldiers Lake 15020008-1430 5. Soldiers Annex Lake 15020008-1440 1900 acres (total)	Mercury in fish tissue (2002)	Mercury fish consumption advisories were issued at all 5 of these lakes in 2002-2003. Excess mercury in fish tissue can be toxic to humans and other animals that eat the fish. These lakes are important recreational resources. ADEQ is currently collecting atmospheric deposition data in support of mercury TMDLs and plans This regional mercury TMDL is to be completed in 2006.	High. Initiated in 2003. To complete in 2009.

ASSESSMENT UNIT	POLLUTANT (YEAR LISTED)	DISCUSSION	PRIORITY RANKING AND SCHEDULE
Little Colorado River From Silver Creek to Carr Wash 15020002-004 6 miles	Suspended sediment (2004)	Sediment may pose a threat to aquatic life. The drainage is more than 8,000 square miles, so determining the source of contamination may be complex. Substantial monitoring data is needed to identify sources. Dates reflect that both TMDLs will be developed at the same time.	To initiate in 2007. To complete in 2009.
Lyman Lake 15020001-0850 1308 acres	Mercury in fish tissue (2004)	A fish consumption advisory for mercury was issued in 2002. Excess mercury in fish tissue can be toxic to humans and other animals that eat the fish. This lake is an important recreational area. Additional monitoring is needed to identify sources.	High. Initiate in 2008. To complete in 2010.
Middle Gila Watershed			
Painted Rock Pesticide Contamination Area: A. Painted Rocks Reservoir 15070101-1020A B. Painted Rocks Borrow Pit Lake 15070201-1010 C. Gila River reaches from Salt River to Painted Rocks Reservoir 15071010-015, -014, -010, -009, -008, -007, -005, -001 D. Salt River, Below 23rd Ave WWTP 15060106B-001D E. Hassayampa River below Buckeye Canal 15070103-001B 99 miles (total) 100 acres (total)	DDT metabolites, toxaphene, and chlordane in fish tissue (2002)	These pesticides still present a high risk to aquatic life and species that prey on them, including humans. A fish consumption advisory is issued. Federally protected Yuma clapper rail and Southwest willow flycatchers sighted in this area could be negatively impacted by the pesticides. This will be a very complex TMDL due to the size of the drainage area and potential sources. This TMDL will require significant monitoring resources to determine any current sources of these historically used pesticides. These pesticides have been banned from use for more than 30 years.	High. Initiate in 2009. To complete in 2011.
Salt Watershed			
Crescent Lake 15060101-0420 157 acres	pH (2002)	Excess nutrient loads can lead to fish kills, which would be detrimental to this important recreational area. Investigation and monitoring is needed to identify sources. Narrative nutrient implementation guidance, when adopted, will be used to determine if the high pH is related to excess nutrients in the lake.	Medium. Initiate in 2010. To complete in 2012.
Tonto Creek From headwaters to unnamed tributary 15060105-013A 8.1 miles	Low dissolved oxygen (2004)	Nitrogen and *E. coli* bacteria TMDLs were completed in 2004. Actions to reduce nitrogen and *E. coli* loadings will also increase dissolved oxygen; therefore, development of the dissolved oxygen TMDLs are a low priority. Will coordinate with Christopher Creek TMDL.	Low. Initiate in 2010. To complete in 2012.
San Pedro Watershed			
Mule Gulch Lavender Pit to Bisbee WWTP discharge 15080301-090B 0.8 miles	Low pH (2002)	Currently establishing site-specific criteria in support of a TMDL. This metal contamination represents a significant threat to wildlife and human health due to the magnitude and frequency of the exceedances. This TMDL involves a large and heavily impacted mining area, where site-specific standards need to be developed before the TMDL can be completed. Long term drought conditions have increased the difficulty collecting samples to identify sources and to model loadings.	Medium. Initiated in 2000. Complete TMDL after site specific criteria are established (2009).
Santa Cruz Watershed			

ASSESSMENT UNIT	POLLUTANT (YEAR LISTED)	DISCUSSION	PRIORITY RANKING AND SCHEDULE
Parker Canyon Lake 15050301-1040 130 acres	Mercury in fish tissue (2004)	Fish consumption advisory issued. Excess mercury in fish tissue can be toxic to humans and other animals that eat the fish. Lake is an important recreational area. Additional monitoring is needed to identify sources. ADEQ will be collecting atmospheric deposition data in support of mercury TMDLs.	High. Initiated in 2006. To complete in 2009.
Rose Canyon Lake 15050302-1260 7 acres	pH (2004)	Low pH poses risks to aquatic life because it allows the release of toxic metals from the lake bottom sediments into the water column. A major wildfire occurred in 2003 in the drainage area of this small, deep recreational attraction on Mount Lemmon. Although exceedances occurred prior to the fire, the TMDL will also need to look at long term impacts of this fire on lake pH.	Medium. Initiate in 2009. To complete in 2011.
Upper Gila Watershed			
Cave Creek From headwaters to South Fork of Cave Creek 15040006-852A 8 miles	Selenium (2004)	Selenium may be toxic to aquatic life or species that feed on them. This stream is classified as a "unique water. The Gila Watershed Partnership is interested in maintaining high quality water in the Gila River and its tributaries. Initial investigations and monitoring indicates that sources are likely natural; therefore, TMDL development has a lower priority.	Medium. Initiate in 2006. To complete in 2009.
Gila River From Bonita Creek to Yuma Wash 15040005-022 6 miles	Sediment (2004)	Sediment may pose a risk to aquatic life. The Gila Watershed Partnership is interested in maintaining high quality water in the Gila River and its tributaries. The TMDLs are complex due to the size of the watershed that extends into New Mexico (nearly 8,000 square miles). ADEQ will coordinate with *E. coli* TMDL on the same reach.	Medium. Initiated in 2006. To complete in 2009.
San Francisco River From Headwaters to New Mexico Border 15040004-023 13.1 miles	Sediment (2004)	Sediment may pose a risk to aquatic life. The Gila Watershed Partnership is interested in maintaining high quality water in the Gila River and its tributaries.	Medium. Initiate in 2009. To complete in 2011.
Verde Watershed			
Granite Creek From headwaters to Willow Creek 15060202-059A 13 miles	Low dissolved oxygen (2004)	Low dissolved oxygen maybe related to nutrient loading. Excess nutrient loads can lead to fish kills. Investigation and monitoring is needed to identify sources.	Low. Initiate in 2010 To complete in 2012.
Watson Lake 15060202-1590 150 acres	Nitrogen, low dissolved oxygen, high pH (2004)	Excess nutrient loads can lead to fish kills, which would be detrimental to this important recreational area. Use narrative nutrient implementation guidance, when adopted, to determine if excess nutrients are impairing the lake. Investigation and monitoring is needed to identify sources.	Medium. Initiate in 2008. To complete in 2010.
Whitehorse Lake 15060202-1630 40 acres	Low dissolved oxygen (2004)	Low dissolved oxygen may pose risks to aquatic life. (Note that newer data does not indicate impairment)	Low. Initiate in 2010. To complete in 2012.

To establish this priority list and schedule the following factors were considered. Those waters with high priority factors will be targeted for TMDL within two years following EPA approval of the 303(d) List, unless specific low priority factors are also cited (see low priority factors with an * below).

High Priority Factors:

1. Substantial threat to health and safety of humans, aquatic life, or wildlife based on
    a. Number and type of designated uses impaired,
    b. Type and extent of risk from the impairment to human health or aquatic life,
    c. Pollutant causing the impairment, or
    d. Severity, magnitude, and duration the surface water quality standard was exceeded.
2. A new or modified individual NPDES / AZPDES permit is sought for discharge to the impaired water.
3. Surface water is listed as a Unique Water or is part of an area classified as a "wilderness area", "wild and scenic river" or other federal or state special protection of the water resource.
4. A species listed as "threatened" or "endangered" under the federal Endangered Species Act inhabits an area and the presence of the pollutant in the surface water is likely to jeopardize the listed species.
5. A delay in conducting the TMDL could jeopardize ADEQ's ability to gather sufficient credible data necessary to develop the TMDL.
6. There is significant public interest and support for development of a TMDL.
7. The surface water or segment has important recreational and economic significance to the public.
8. The pollutant has been listed for eight years or more (starting with the 2002 listing).

Medium Priority Factors:

1. The surface water fails to meet more than one designated use.
2. The pollutant exceeds more than one surface water quality standard.
3. The exceedance is correlated to seasonal conditions caused by natural events such as storms, weather patterns, or lake turnover.
4. Actions in the watershed may result in the surface water attaining applicable water quality standards; however, load reductions may take longer than the next 303(d) listing cycle.
5. The type of pollutant and other factors relating to the surface water or segment make the TMDL very complex.
6. ADEQ's administrative needs, including TMDL schedule commitments with EPA, permitting needs, or basin priorities that require completion of the TMDL.

Low Priority Factors:

1. * ADEQ has formally submitted a proposal to delist the surface water or pollutant to EPA. If ADEQ makes the submission outside of listing process cycle, the change in priority ranking will not be effective until EPA approves the report.
2. * ADEQ has modified or formally proposed a modification to the applicable surface water quality standard or designated use which would result in the surface water no longer being impaired, but the modification has not yet been approved by EPA.
3. * The surface water is expected to attain surface water quality standards due to any of the following:
    a. Recently instituted treatment levels or best management practices in the drainage area,
    b. Discharges or activities related to the impairment have ceased, or
    c. Actions have been taken and the controls are in place or scheduled for implementation that are likely to bring the surface water back into compliance.
4. The surface water is ephemeral or intermittent. ADEQ shall re-prioritize the surface water if the presence of the pollutant in the listed water poses a threat to the health and safety of humans, aquatic life, or wildlife using the water (High priority 1) or the pollutant is contributing to the impairment of a downstream, perennial surface water.
5. The pollutant poses a low ecological and human health risk.
6. Insufficient data exist to determine the source of the pollutant load.
7. * The uncertainty of timely coordination with national and international entities concerning international waters makes TMDL development complex.
8. * Naturally occurring conditions are a major contributor to the impairment, and a site specific standard will need to be developed before the TMDL can be completed.
9. No documentation or effective analytical tools exist to develop a TMDL for the surface water with reasonable accuracy.

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Appendix D

APPENDIX D
CRITICAL CONDITIONS

To determine whether an assessment unit is no longer impaired, samples must be collected during critical conditions and at critical locations. These conditions and locations were either noted in the TMDL investigations or are based on other factors, such as the fish consumption advisory action level. As TMDLs are completed, more waters will be added to this list.

ASSESSMENT UNIT DESCRIPTION REACH NUMBER	PARAMETERS	TMDL STATUS	CRITICAL CONDITIONS	CRITICAL SITES OR LOCATIONS (ADEQ site number)
Bill Williams Watershed				
Alamo Lake 15030204-0040	Mercury in fish	Ongoing	Methylmercury concentration in fish tissue <0.3 mg/kg	
Alamo Lake 15030204-0040	pH, ammonia	Scheduled	Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	
Boulder Creek From Wilder Creek to Copper Creek 15030202-005A	Copper, Zinc, Arsenic	Completed 2004	Stream flow less than 0.75 cfs, which is low flow, intermittent, or "base flow"	Below Hillside Mine - 101010 Above Hillside Mine - 102023
Coors Lake 15030204-5000	Mercury in fish	Scheduled	Methylmercury concentration in fish tissue <0.3 mg/kg	
Colorado – Grand Canyon Watershed				
Colorado – Lower Gila Watershed				
Painted Rocks Borrow Pit 15070201-1010	Dissolved oxygen	Scheduled	Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	
Little Colorado Watershed				
Bear Canyon Lake 15020008-0130	pH	Scheduled	Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	
Upper Lake Mary and Lower Lake Mary 15020015-0890 15020015-0900	Mercury in fish	Ongoing	Methylmercury concentration in fish tissue <0.3 mg/kg	
Little Colorado River (near Nutrioso Creek) 15020001-009, -010	Turbidity	Completed 2002	Winter-spring runoff at approximately 29 cfs and summer runoff at approximately 13 cfs	Near USGS gage 09383400 - 101174
Long Lake 15020008-0820	Mercury in fish	Ongoing	Methylmercury concentration in fish tissue <0.3 mg/kg	
Lyman Lake 15020001-0850	Mercury in fish	Ongoing	Methylmercury concentration in fish tissue <0.3 mg/kg	
Nutrioso Creek From headwaters to Little Colorado River 15020001-017, -015	Turbidity	Completed 2000	Spring runoff at approximately 4 to 14 cfs	Big Wall site - 102112 Old background site - 101982
Rainbow Lake 15020005-1170	Nutrients (N&P) and pH	Completed 2000	Low lake level. Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	
Soldier's Annex Lake 15020008-1430	Mercury in fish	Ongoing	Methylmercury concentration in fish tissue <0.3 mg/kg	
Soldier's Lake 15020008-1440	Mercury in fish	Ongoing	Methylmercury concentration in fish tissue <0.3 mg/kg	

ASSESSMENT UNIT DESCRIPTION REACH NUMBER	PARAMETERS	TMDL STATUS	CRITICAL CONDITIONS	CRITICAL SITES OR LOCATIONS (ADEQ site number)
Middle Gila Watershed				
Alvord Park Lake 15060106B-0050	Ammonia	Scheduled	Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	
Chaparral Lake 15060106B-0300	Dissolved oxygen, E. coli	Scheduled	For the DO, meets narrative nutrient standards once new narrative nutrient implement procedures are adopted.	
Cortez Park Lake 15060106B-0410	Dissolved oxygen, pH	Scheduled	Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	
French Gulch From headwaters to Hassayampa River 15070103-239	Copper, cadmium, zinc	Completed 2005	Storm induced runoff	Below Zonia Mine - 101620
Hassayampa River From headwaters to Copper Creek 15070103-007A	Cadmium, copper, zinc	Completed 2002	Low flow and spring runoff (approximately 4 to 6 cfs)	Above McCleur Mine – 101816 Below McCleur Mine - 101817 Above Cash Mine trib - 101067 Below Cash Mine trib - 101065
Mineral Creek From Devils Canyon to Gila River 15050100-012B	Copper	Scheduled	Storm induced runoff.	
Queen Creek From headwaters to Superior Mine discharge 15050100-014A, -014B	Copper	Ongoing		
Turkey Creek From headwaters to Poland Creek 15070102-036B	Cadmium, copper, zinc, lead	Completed 2005	Storm induced runoff, snow melt and base flow do not cause impairment	101627- Above Golden Belt and Turkey mines 101251- Below mines
Salt Watershed				
Canyon Lake 15060106A-0250	Dissolved oxygen	Scheduled	Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	
Christopher Creek and upper Tonto Creek 15060105-353, -013A, -013B	*E. coli*	Completed 2004	Summer season	
Christopher Creek and upper Tonto Creek 15060105-353, -013A, -013B	Nitrogen	Completed 2005	Summer season	
Crescent Lake 15060101-0420	pH	Scheduled	Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	
Pinto Creek From headwaters to Roosevelt Lake 15060103-018A, -018B, -018C	Copper	Completed 2001 Phase II ongoing	Storm induced runoff	
San Pedro Watershed				
Mule Gulch Headwaters to Whitewater Draw 15080301-090A, -090B, -090C	Cadmium, copper, zinc, pH	Ongoing	Storm induced runoff	
Santa Cruz Watershed				
3 R Canyon From headwaters to Sonoita Creek 15050301-558A, -558B, -558C	Cadmium, copper, zinc, pH	Completed 2003	Storm induced run-off	
Alum Gulch From headwaters to Sonoita Creek 15050301-561A, -561B	Cadmium, copper, zinc, pH	Completed 2003	Storm induced run-off	
Arivaca Lake 15050304-0080	Mercury in fish	Completed 1999	Methylmercury concentration in fish tissue <0.3 mg/kg	

ASSESSMENT UNIT DESCRIPTION REACH NUMBER	PARAMETERS	TMDL STATUS	CRITICAL CONDITIONS	CRITICAL SITES OR LOCATIONS (ADEQ site number)
Harshaw Creek From headwaters to Sonoita Creek 15050301-025	Copper, pH	Completed 2003	Storm induced run-off	
Lakeside Lake 15050302-0760	Nitrogen, phosphorus, chlorophyll, low DO, ammonia	Completed 2005	Nutrient levels is reclaimed water discharges	
Parker Canyon Lake 15050301-1040	Mercury in fish	Ongoing	Methylmercury concentration in fish tissue <0.3 mg/kg	
Pena Blanca Lake 15050301-1070	Mercury in fish	Completed 1999	Methylmercury concentration in fish tissue <0.3 mg/kg	
Rose Canyon Lake 15050302-1260	pH	Scheduled	Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	
Upper Gila Watershed				
Luna Lake 15040004-0840	Nutrients (N&P), pH, and dissolved oxygen	Completed 2000	Low lake levels. Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	
Verde Watershed				
Oak Creek At Slide Rock State Park 15060202-018B	E. coli and fecal coliform	Completed 1999	Swimming season	Slide Rock State Park sample sites (5 sites)
Pecks Lake 15060202-1060	Nutrients (N&P), pH, dissolved oxygen	Completed 2002	Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	
Stoneman Lake 15060202-1490	Nutrients (N&P), pH, and dissolved oxygen	Completed 2000	Ephemeral lake. Do not assess if depth less than 1 meter. Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	
Verde River From Cottonwood Creek to Fossil Creek 15060202-025, -037, -015, -001 and 15060203-027, -025	Turbidity	Completed 2002	Storm induced run-off, approximately 1180 cfs.	USGS gage near Clarkdale 0950400 - 100738
Watson Lake 15060202-1590	Nitrogen, dissolved oxygen, pH	Scheduled	Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	
Whitehorse Lake 15060202-1630	Dissolved oxygen	Ongoing	Determine if lake meets narrative nutrient criteria once narrative nutrient implement procedures are adopted.	

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APPENDIX E
Delisting Impairments

Pollutants may be removed from the 303(d) List (delisted) because the TMDL is approved; however, the pollutant is still impairing the reach. A pollutant can be shown to be "no longer impairing" an assessment unit if sufficient data to show that the use is now attaining based on:

- New data, and samples represent critical conditions and critical locations;
- New surface water quality criterion or designated use;
- New assessment criterion or methods;
- Assessment unit is split and no current or historic data from this portion of the surface water would support an impairment decision;
- Naturally occurring conditions are shown to be the sole cause of not meeting the water quality criterion; or
- Reevaluation of the assessment information indicates an error or deficiency in the original analysis resulted in an inappropriate listing.

Pollutants Being Delisted

ASSESSMENT UNIT DESCRIPTION REACH NUMBER	SIZE (miles/acres)	POLLUTANT DELISTED	REASON AND COMMENTS
Bill Williams Watershed			
Little Colorado Watershed			
Nutrioso Creek From headwaters to Nelson Reservoir 15020001-017A	13.3 miles	Turbidity/ sediment	The current (and proposed) suspended sediment concentration standard is not being exceeded. The assessment unit is no longer impaired, based on new data, new criteria, and new assessment methods.
Middle Gila Watershed			
Turkey Creek From unnamed tributary to Poland Creek 15070102-036B	21 miles	Cadmium and zinc	Only 1 of 46 cadmium samples exceeded criteria to protect Fish Consumption and agricultural uses. The zinc criteria were not exceeded in 45 sampling events. The assessment unit remains impaired by copper and lead.
Salt Watershed			
Salt River From Stewart Mountain Dam to Verde River 15060106A-003	10.1 miles	Copper	No copper exceedances in 22 total and 22 dissolved copper samples. Reach remains impaired due to low dissolved oxygen.
San Pedro Watershed			
San Pedro River From Mexico border to Charleston 15050202-008	28.3 miles	Copper	Copper no longer impairing the assessment unit. No exceedances of acute or chronic A&W standards during the last 3 years of monitoring. Only 2 samples in 17 exceeded the criterion to protect agricultural uses ("attaining" based on binomial). Assessing reach as Category 2 -- attaining some uses.
Santa Cruz Watershed			
Humbolt Canyon From headwaters to Alum Gulch 15050301-340	2 miles	Cadmium, zinc and low pH	Applicable standards changed when reach was determined to be ephemeral (rather than intermittent). Old data was assessed using revised designed uses. Reach is still impaired due to copper, but the other parameters are being delisted.
Upper Gila Watershed			
Verde Watershed			
Verde River From Bartlett Dam to Camp Creek 15060203-004	11.6 miles	Copper and selenium	No exceedances of the copper criteria in 22 total and 22 dissolved samples. No exceedances of the selenium criteria in 22 samples. Assessing reach as Category 1 – attaining all uses.

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APPENDIX F
Water Quality Improvements

Water quality improvements have resulted in pollutants no longer impairing an assessment unit. Each is a success story! Significant resources have been used to identify sources and control pollutant contributions in each case. No current delistings (Appendix E) are occurring based on these improvements.

These water quality improvements are *dependent* on continued application of the improvement noted in this table. Therefore, decision makers about future activities in the watershed or additional discharges need to be aware and continue to support these improvements.

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	POLLUTANTS DELISTED DUE TO IMPROVEMENTS	ACTIONS RESULTING IN IMPROVEMENTS	TMDL APPROVED
BILL WILLIAMS WATERSHED				
COLORADO – GRAND CANYON WATERSHED				
LOWER COLORADO - GILA WATERSHED				
Lake Havasu (Thompson Bay) 15030101-0590	19,780 a	*E. coli* bacteria (Delisted in 2002; first listed in 1996)	1. Improved sanitary facilities at beaches. 2. Public education concerning marine wastewater disposal. 3. Improvements in public wastewater treatment facilities to reduce nutrient loading. 4. Improvement in flow into Thompson Bay under London Bridge. *No remaining impairments	No
Painted Rock Borrow Pit 15070201-1010	185 a	Dieldrin in fish tissue. (Delisted in 2002; first listed in 1988)	General use of the pesticide dieldrin banned *Listed in Category 5 for other pollutants	No
LITTLE COLORADO WATERSHED				
Nutrioso Creek From headwaters to Nelson Reservoir 15020001-017A	13.3 m	Turbidity (To delist in 2006; first listed in 1992)	Cattle removed from the riparian area through addition of fencing and alternative sources of water. Riparian area improvements noted. *No remaining impairments	Yes. TMDL approved in 2002
MIDDLE GILA WATERSHED				
Gila River From the Salt River to Painted Rock Reservoir 15070101-001, 005, 007, 008, 009, 010, 014, 015	82.5 m	Dieldrin in fish tissue. (Delisted in 2002; first listed in 1988)	General use of the pesticide dieldrin banned *Listed in Category 5 for other pollutants	No
Hassayampa River From Buckeye Canal to Gila River 15070101-001B	2.3 m	Dieldrin in fish tissue. (Delisted in 2002; first listed in 1988)	General use of the pesticide dieldrin banned *Listed in Category 5 for other pollutants	No
Mineral Creek From Devils Canyon to Gila River 15050100-012B	19.6 m	Beryllium, zinc, and low pH (Delisted in 2004; first listed in 1992)	Mineral Creek is diverted around a large mining operation. Monitoring surface water quality to assure this is sufficient to protect water quality in the stream. *Listed in Category 5 for other pollutants	No
Painted Rock Reservoir 15070101-1020A	100 a	Dieldrin in fish tissue. (Delisted in 2002; first listed in 1988)	General use of the pesticide dieldrin banned *Listed in Category 5 for other pollutants	No
Salt River From 23rd Avenue WWTP to Gila River 15060106B-001D	14.1 m	Dieldrin in fish tissue. (Delisted in 2002; first listed in 1988)	General use of the pesticide dieldrin banned *Listed in Category 5 for other pollutants	No
Tempe Town Lake 15050100-1588	220 a	Low pH (Delisted in 2004; first listed in 2002)	Treating lake with copper sulfate to control algal growth in coordination with a rigorous monitoring program. *Listed in Category 5 for other pollutant	4B alternative – Lake management plan

SURFACE WATER DESCRIPTION REACH NUMBER	SIZE (miles/acres)	POLLUTANTS DELISTED DUE TO IMPROVEMENTS	ACTIONS RESULTING IN IMPROVEMENTS	TMDL APPROVED
SALT WATERSHED				
Pinal Creek From lower Pinal Creek WTP to Salt River 15060103-280D	6.4 m	Copper, manganese, zinc, and low pH (Delisted in 2002; first listed in 1988)	Ground water is pumped so that surface water flow discontinues (flow was intermittent originally in this area). The water is treated and pumped back into the stream, providing clean perennial flow. *No remaining impairments	No
SAN PEDRO WATERSHED				
SANTA CRUZ WATERSHED				
UPPER GILA WATERSHED				
VERDE WATERSHED				
Munds Creek From headwaters to Oak Creek 15060202-415	17.0 m	*E. coli* bacteria, nitrogen and phosphorus (Delisted in 2002; first listed in 1994)	Wastewater reuse applications modified to keep effluent from contaminating Munds Creek. *No remaining impairments	No
Ashbrook Wash From Grande Wash to Verde River 15060203-989	2 m	*E. coli* bacteria (To delist in 2006; first listed in 2004)	Wastewater treatment plant no longer discharging to this wash. *No remaining impairments	No

Total No Longer Impaired due to water quality improvements:

15 stream reaches; 163.9 stream miles

4 lakes/reservoirs; 20,285 acres

Appendix G

ADEQ
Arizona Department
of Environmental Quality

SURFACE WATER ASSESSMENT METHODS AND TECHNICAL SUPPORT

November 2008

Prepared by
Diana Marsh
Surface Water Section
Standards and Assessment Unit
Arizona Department of Environmental Quality

With Assistance From
Linda Taunt, Assistant Director, Water Quality Division
Chris Varga, Manager, Surface Water Section
Steve Pawlowski, Supervisor, Standards and Assessment Unit
Jason Sutter, Supervisor, TMDL Unit
Jason Jones, Supervisor, Monitoring Unit
Anel Avila, Assessment Program

The current assessment and further assessment, monitoring, or TMDL information can be obtained at ADEQ's web site: http://www.azdeq.gov/environ/water/assessment/index.html.

Further information can also be obtained by contacting the following ADEQ program staff:

Assessments: Anel Avila (602) 771-4647
Bioassessments and physical integrity standards: Patti Spindler (602) 771-4543
Fish Advisories: Sam Rector (602) 771-4536
GIS Analysis: Jean Ann Rodine (602) 771-4400
Groundwater Program: Doug Towne (602) 771-4412
Lake Program: Susan Fitch (602) 771-4541
Monitoring Program: Jason Jones (602) 771-2235
NPDES/AZPDES Permit Program: Debra Daniel (602) 771-4689
Standards Program: Steve Pawlowski (602) 771-4219
TMDL Program: Jason Sutter (602) 771-4468
Water Quality Improvement Grants (602) 771-4635

EXECUTIVE SUMMARY

Arizona's *Surface Water Assessment Methods and Technical Support* document is intended as an analytical tool to guide individuals through a standardized assessment process. This document describes Arizona Department of Environmental Quality (ADEQ) methods to evaluate water quality data and assess designated use support of surface water. This document is written to accompany the 2006 Integrated Surface Water Quality Assessment and Impaired Water List (ADEQ, 2006).

An assessment entails analyzing and integrating multiple types of data to address the following primary objectives:

- Determine whether each designated use assigned to an assessment unit is "attaining" or "impaired;"
- If impaired, determine the pollutant(s) causing impairment;
- Compile descriptive information about the surface water; and
- Provide future monitoring priorities (the planning list).

If impaired and development of a TMDL is needed, the surface water is placed on the federal 303(d) List. An impaired water is *not* placed on this list, when alternative pollution control requirements are in place that will bring the surface water into compliance with its standards (e.g., a consent decree), if an approved TMDL is being implemented, or if the impairment is solely due to natural conditions.

This document is organized according to the steps taken in the assessment process for lakes and streams. It describes a standardized assessment process; however, the process incorporates flexibility for unique situations and allows for the use of sound scientific judgment. The assessment report provides justification for any variations and clear documentation concerning the types of data and information used in making assessments.

Section 1 – General Assessment Process and Regulatory Framework

Section 2 – Monitoring Data
- The Assessment Period
- Data Sources
- ADEQ's Monitoring Strategy
- Data Reliability
- Data Management

Section 3 – Data Interpretation and Assessment Criteria
- Data Interpretation
- Data Aggregation – The Seven-Day Rule
- Assessing Attainment
- Assessing Impairment
- No Longer Impaired

Section 4 – Final Listings
- Assessment Categories
- Public Involvement and EPA Review
- Prioritizing and Scheduling TMDLs.
- Monitoring – The Planning List

Section 5 – Further Technical Rationales

SECTION 1
GENERAL ASSESSMENT PROCESS AND THE REGULATORY FRAMEWORK

Every two years, ADEQ is required by the federal Clean Water Act to conduct a comprehensive analysis of water quality data associated with Arizona's surface waters to determine whether state surface water quality standards are being met and designated uses are being supported. This report is submitted to the U.S. Environmental Protection Agency (EPA) for approval. Once approved it is used to guide water resource management decisions.

The surface water quality assessment process can be summarized as a six step process as follows:

Step 1 – Assemble all readily available monitoring data and water quality related information. Determine whether the data meets requirements under the state's Impaired Water Identification Rule to be reasonably current, credible, scientifically defensible, and representative of water quality conditions in the surface water.
Step 2 – Determine the applicable designated uses and related numeric and narrative standards.
Step 3 – Analyze the data, determine exceedances of standards, and determine whether sufficient data exists to assess each designated use.
Step 4 – Assess the surface water, placing it in the appropriate EPA assessment category and on the 303(d) List, if a TMDL is needed.
Step 5 – Determine monitoring priorities based on data gaps, needs for TMDL development, and effectiveness monitoring.
Step 6 – Provide public review of the integrated assessment and 303(d) listing report and revise the report as appropriate.

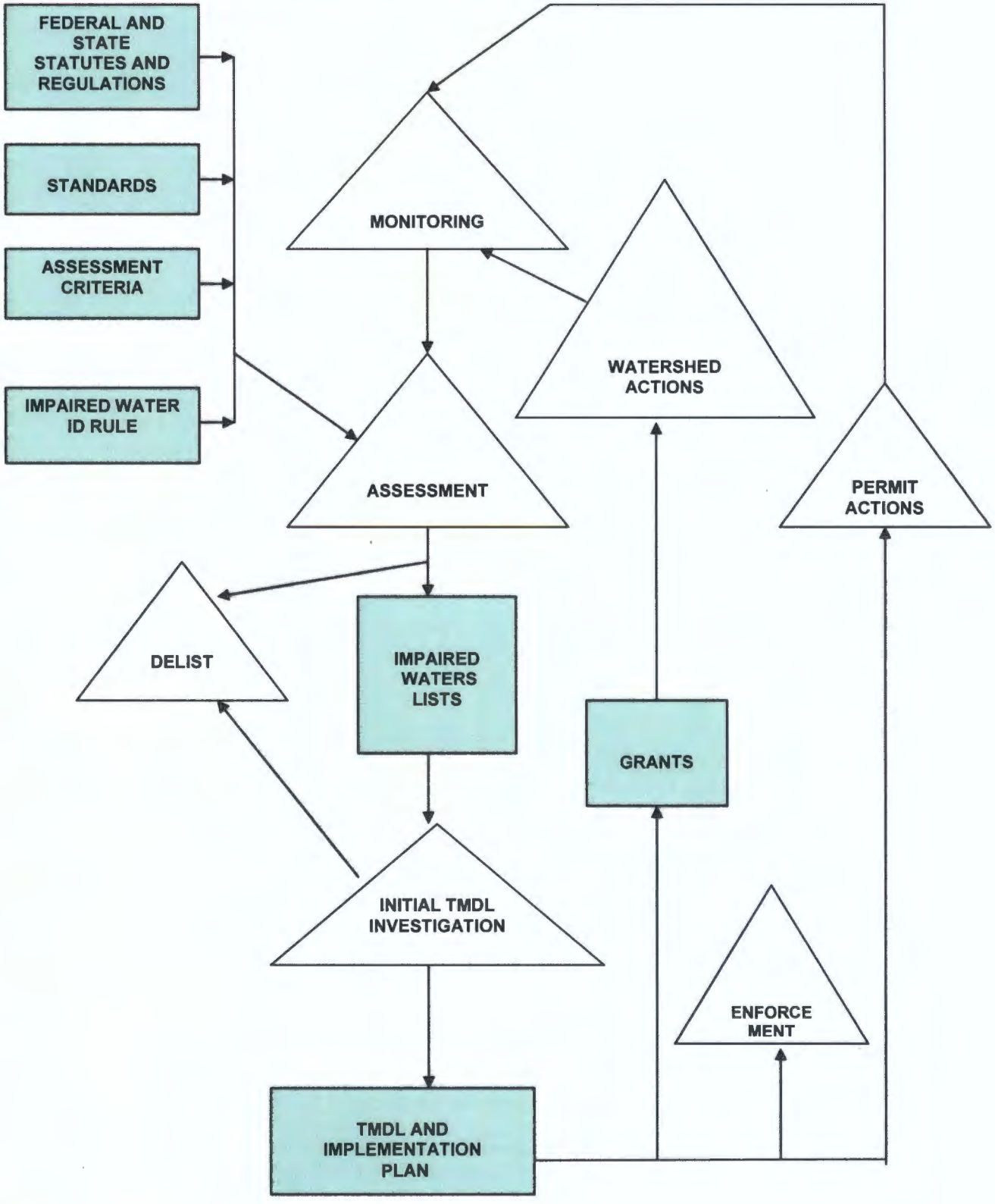
Water quality assessments should be seen as part of an interwoven set of water quality protection and improvement programs at ADEQ **(Figure 1)**. The assessment process compares monitoring data to standards, identifies impaired waters, indicates where additional monitoring should be targeted, and initiates the TMDL loading analysis process.

The Department also works with watershed groups and interested parties to plan and implement actions so that surface water quality standards will be met. Grants are awarded to fund water quality improvement projects. Effectiveness monitoring following these projects is used during the next assessment cycle.

Permit discharge limits or enforcement actions can occur based on assessments of ambient data and TMDL development, although this has been rare. Facilities with permitted discharges may be asked to do additional monitoring when the surface water that receives the discharge is listed as impaired. This monitoring provides a scientific basis for modeling loading contributions (if any) from the discharge. Such data would also be used in the future assessments.

The assessment is therefore also acting as an evaluation of the water quality protection programs, a catalyst for focusing monitoring resources and, if necessary, encourages ADEQ to take other actions necessary so that surface water quality standards are being met.

FIGURE 1 – ASSESSMENTS AND WATER QUALITY PROTECTION



Balancing State Statues and Rules with Federal Regulations and Guidance

The Clean Water Act

In 1972, Congress passed Public Law 92-500, the Federal Water Pollution Control Act, commonly known as the Clean Water Act. The goal of this act was to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. ADEQ implements the Clean Water Act in Arizona, with oversight from the U.S. Environmental Protection Agency (EPA).

The mandate to do assessments and determine which surface waters are impaired comes from this act. This assessment methods document addresses federal monitoring, assessment, and listing requirements found in Sections 106, 205, 303, 305, and 314 of the Clean Water Act.

- Sections 106 and 205 require the states to compile, analyze, and annually submit a report on surface water quality. The report is to include monitoring conducted by ADEQ and other monitoring entities under grants and contracts with ADEQ

- Section 303 requires ADEQ to:
  - Adopt, with EPA approval, water quality standards and review these standards every three years.
  - Monitor waters and submit a list of surface waters where technology-based effluent limitations required by section 301 are not stringent enough to attain and maintain applicable water quality standards (impaired waters). These 303(d) listed waters are then prioritized for the development of a Total Maximum Daily Load (TMDL) for each pollutant causing impairment. The establishment of TMDLs is required, regardless of whether the surface water is impaired by point sources, nonpoint sources, or a combination of both. As part of the TMDL process, the Department must either set appropriate controls or work with appropriate parties to implement actions that will improve water quality, so that the waters meet standards that support their designated uses.

- Section 305 requires an assessment report that describes and analyzes water quality conditions of all surface waters in Arizona. This assessment report defines the extent that state waters are meeting water quality standards.

- Section 314 adds further requirements specific to lakes.

Federal Regulations and Guidance

The Federal Code of Regulations § 122, 124, and 130.7 establish further and more specific federal requirements concerning the identification of impaired waters (referred to as "water quality limited waters"). No recent changes have occurred in these regulations.

In 2002, EPA published the *Consolidated Assessment and Listing Methodology – Toward a Compendium of Best Practices* (CALM). ADEQ has adopted many of the ideas published in this document, such as core parameter coverage. The CALM document provides information on monitoring network design and use of chemical, biological, toxicity, bacteria, and habitat data to support assessments. It also provides technical support such as statistical considerations for data quality objectives and hypothesis testing. This information can be downloaded from the EPA web site: http://www.epa.gov/owow/monitoring/calm.html.

Guidance for 2006 Assessment, Listing, and Reporting Requirements Pursuant to Sections 303(d), 305(b), and 319 of the Clean Water Act was published by EPA in July 29, 2005. This document provides EPA's policies concerning data interpretation, along with recommended reporting format. A copy of this guidance can be downloaded at http://www.epa.gov/owow/tmdl/2006IRG. Since 2001, EPA has recommended that the states submit an integrated report that includes both the assessment required under section 305(b) and the list of impaired waters required under 303(d).

Two significant clarifications in the federal 2006 guidance are reflected in Arizona's assessment methods:

- To determine whether an instantaneous "grab" sample represents the averaging period for the standard, states should consider contextual information such as stream flow, precipitation events, discharges near the monitoring site, and land use. For example, chronic aquatic and wildlife criteria are based on a 4-day exposure period; however, when states do not have 4-days of data to average, contextual information should be considered to determine whether levels of a pollutant under study were likely to have remained fairly constant over the averaging period. Such contextual information was used in this assessment process when using a grab sample, especially when applying chronic criteria.

- Surface waters can be listed in more than one assessment category. For example, if a stream was assessed as impaired by selenium subsequent to development of a TMDL for copper and zinc, that reach could be listed in Category 4A for copper and zinc and also in Category 5 for mercury.

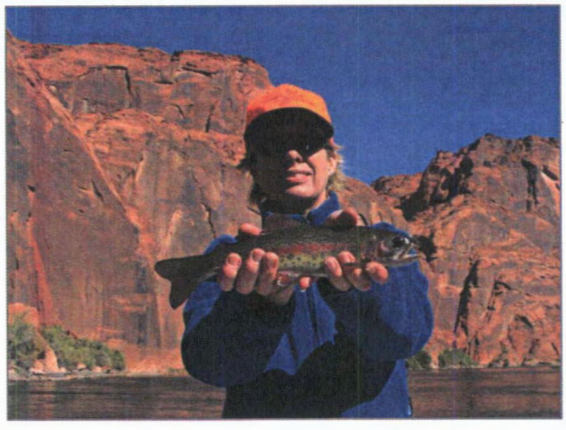
More information about the methods involved is provided later in this document.

Arizona's Surface Water Standards and Designated Uses

Arizona sets narrative and numeric surface water standards for water quality based on the uses people and wildlife make of the water. These "designated uses" are specified in the standards for individual surface waters, or if the surface water is not named in the rule, the designated uses are determined by the tributary rule. The tributary rule assigns designated uses based on flow regime and elevation (A.A.C. R18-11-105). (A summary of surface water quality criteria is provided **Appendix A**). A copy of the complete rules can be downloaded at the Secretary of States Office website at: http://www.azsos.gov/public_services/table_of_contents.htm.

Each surface water has at least two designated uses. Water quality is judged acceptable or impaired based on standards established to protect each designated use. Arizona's designated uses are:

- Aquatic Wildlife (coldwater, warmwater, effluent-dependent, or ephemeral)
- Fish Consumption
- Body Contact (Full or Partial)
- Domestic Water Source
- Agricultural Irrigation
- Agricultural Livestock Watering



Narrative surface water standards (A.A.C R18-11-108) protect water quality when a numeric standard is not available or is insufficient. The state TMDL statute requires development of narrative implementation procedures before narrative standards can be applied to 303(d) listing decisions. Narrative implementation documents for toxics, bottom deposits, and nutrients, along with a narrative biocriteria implementation document, are currently under development but were not available for this assessment. Therefore, Arizona's narrative surface water quality standards were not applied during this assessment.

Some surface waters have special water quality standards that must be met. For example, site specific standards have been established for the following waters:

- Waters classified as "unique waters" (an outstanding state resource waters);
- Waters classified as effluent dependent waters (surface waters that would be ephemeral if not for the discharge of treated wastewater);
- Waters with moderating provisions established in their NPDES or AZPDES discharge permits (i.e., mixing zones or a pollutant-specific variance);
- Waters with nutrient standards, as specified in A.A.C. R18-11-109(F); and
- Colorado River reaches with salinity standards (three benchmark sites along the river between Hoover Dam and Imperial Dam) as specified in A.A.C. R18-11-110.

Site specific standards can also be developed for impaired waters where natural conditions alone would cause the standards to be exceeded. Currently ADEQ is developing such site specific standards for Mule Gulch and Pinto Creek.

Surface water quality standards are reviewed and revised on a three-year cycle. The standards approved in 2002 were used for this assessment and listing process.

Arizona's TMDL Statute

In 2000, the Arizona Legislature promulgated Arizona Revised Statues (A.R.S.) Title 49, Chapter 2, Article 2.1, (the TMDL Statute) which identifies a general process for making impairment decisions and for developing Total Maximum Daily Loads **(Appendix B)**. A copy of these statutes can be downloaded at the Secretary of States Office website at: http://www.azleg.state.az.us/arizonarevisedstatutes.asp. The statute requires ADEQ to:

- Adopt, by rule, the methods used to identify impaired waters;
- Use only reasonably current, credible, and scientifically defensible data;
- Consider the nature of the water (e.g., ephemeral, intermittent, perennial, effluent dominated) in assessing whether an assessment unit is impaired;
- Determine whether pollutant loadings solely from naturally occurring conditions are sufficient to exceed a water quality standard; and
- Adopt narrative standards and biocriteria implementation procedures through a public process before using these to identify impaired waters.

The statute specifies a process for priority ranking, scheduling, developing, reviewing, and implementing TMDLs, and it mandates the development of rules to govern impaired water identification decisions.

Arizona's Impaired Water Identification Rule

Arizona developed the *Impaired Water Identification Rules* Arizona Administrative Code R18-11-601 through 606) in 2002 **(Appendix B)**.These rules establish methods and criteria to:

- Identify an assessment unit as impaired;
- Determine when an assessment unit is no longer impaired (delisting);
- Prioritize the development of Total Maximum Daily Loads;
- Determine whether a dataset is "credible," and therefore, used for assessments and TMDL development;
- Interpret data;
- Consider contextual information in a weight-of-evidence approach; and
- Determine the spatial extent of the surface water listing.

The Impaired Water Identification rules are currently being revised to improve consistency with federal listing guidance, and based on best available science and statistics. However, the draft revised rules were not adopted in time for the 2006 assessment, and therefore, were *not* applied to this assessment.

The Impaired Water Identification Rules establish a process for identifying impaired waters; however, they do not establish methods for identifying waters that are *attaining* their uses. This assessment methods document goes the next step and integrates impairment and attainment methods and criteria.

Off Road Vehicle Impacts on Big Sandy River

SECTION 2
MONITORING DATA

Data Sources

Monitoring data used in assessments come from a variety of sources: ADEQ's field staff, federal agencies, state agencies, permitted discharge facilities, and even volunteer monitoring groups. Because the objective of collecting the data and data quality varies, ADEQ reviews all readily available surface water quality related data, determines if it meets credible data requirements in the Impaired Water Identification Rule, and uses the scientifically supported data for assessment determinations. The STORET database was also queried. (STORET is EPA's storage and retrieval system for housing surface water data from federal and state agencies.)

The Department encourages the submittal of such water quality data from the general public, other agencies, and permitted dischargers throughout the year. When submitted, other pertinent information should be provided, such as: site locations, sampling and quality assurance plans, monitoring purpose, field observations, and lab notations.

Monitoring the Virgin River

To be considered in the assessment and listing process, data from agencies and other entities must be received by the applicable deadline and entered into ADEQ's water quality database. Therefore, data sets need to be submitted in an electronic format that can be readily uploaded into ADEQ's database.

Water quality related data includes, but are not limited to: water chemistry, contaminated sediments, bacteria, algae, bioassessments, fish tissue concentrations, fish kills, weed harvesting, physical habitat, beach closures, drinking water advisories, and riparian conditions. Although ADEQ cannot use narrative, bioassessment, physical habitat data, and other qualitative data for a listing decision until appropriate implementation procedures are adopted, such information is considered as "weight-of-evidence" during a listing decision, and has been used by EPA as evidence of impairment.

Any inherent bias in the data is considered when using the data using the weight-of-evidence approach. For example, if the monitoring objective was to establish pristine/reference conditions, exceedances should be rare are more likely due to natural conditions. Whereas, if the objective was to determine the effectiveness of watershed improvements, the monitoring site locations and contextual conditions when the samples were collected need to be evaluated along with the data.

The Assessment Period

The Department assembles and evaluates all existing and readily available water quality related data and information collected during the assessment period. This focuses assessments on the most recent data to accurately portray the quality of the surface water in question.

Generally, data and information collected during the most recent *five* year period are used to base assessment and 303(d) listing decisions; however, because the assessment was delayed, almost six years of data were considered for the 2006/2008 assessment. The Department did include data collected after December 2005 and submitted before June 2006 if the data would affect a listing decision. Newer data could not be considered during this assessment due to deadlines for completion and the need to comply with extensive public review periods mandated by both federal regulations and state statutes. Data collected after January 1, 2006 will be evaluated for the 2010 Integrated Report.

ADEQ's Monitoring Strategy

Although data come from a variety of agencies, the bulk of the data used in assessments is generated by ADEQ's field staff. ADEQ obtains water quality data specifically to assess the biological, chemical, and physical integrity of Arizona's surface waters. Where possible, monitoring is coordinated with other agencies to minimize duplication of effort.

ADEQ surface water monitoring is conducted to support the following objectives:

- Assess the status of water quality and identify impaired waters and the stressors causing impairment;
- Develop Total Maximum Daily Loads for impaired waters and identify sources contributing to that impairment;
- Establish and maintain regional reference conditions to support biocriteria;
- Determine compliance with applicable surface water quality standards;
- Determine whether water quality is being adequately protected or is being degraded, according to antidegradation rules (Arizona Administrative Code R18-11-107), especially for waters classified as "unique waters;"
- Determine water quality trends at long-term sites; and
- Support development of new water quality standards.

Watershed Characterization Monitoring – ADEQ has identified 10 major surface watersheds in Arizona. In 1998, ADEQ adopted a rotational watershed framework in which staff conducts water quality monitoring in wadeable, perennial streams located in two watersheds each year. All 10 watersheds are normally monitored over a 5-year period.

Arizona's Watershed Cycle

WATERSHEDS	Focus Year											
	00	01	02	03	04	05	06	07	08	09	10	11
Bill Williams				X						X		
Colorado – Grand Canyon						X					X	
Colorado – Lower Gila				X				X				
Little Colorado		X						X				
Middle Gila			X						X			
Salt			X						X			
San Pedro	X					X					X	
Santa Cruz		X					X					
Upper Gila	X						X					
Verde					X					X		

The purpose of this monitoring is to obtain basic water quality data on streams and lakes in each watershed. Along with the water samples, data are collected to support proposed bioassessments, habitat assessments, and physical integrity assessments (see analytical suite text box). Data collection is focused in wadeable, perennial streams.

Analytical Measurements for Streams

PARAMETER GROUP	ANALYTES	FREQUENCY SEASON
Field Data	Dissolved oxygen (DO), conductivity, percent saturation (of DO), pH, redox potential, temperature, and total dissolved solids	Quarterly
Bacteria	*E. coli*	Quarterly
General Chemistry	Alkalinity, bicarbonate, carbonate, chloride, conductivity, fluoride, hardness, pH, sulfate, suspended sediment concentration (SSC), total dissolved solids, (TDS), total suspended solids (TSS), turbidity	Quarterly
Nutrients	Ammonia, phosphorus, nitrate/nitrite, total Kjeldahl nitrogen (TKN)	Quarterly
Metals (total and dissolved)	Cadmium, chromium, copper, lead, mercury, nickel, silver, zinc	Quarterly
Metals (total only)	Antimony, arsenic, boron, barium, beryllium, calcium, magnesium, manganese, selenium, thallium	Quarterly
Biocriteria	Macroinvertebrates	Once in spring
Physical/Habitat	Habitat assessment, pebble count, riffle embeddedness, bankfull delineation, depositional features	Once a year

Lake data and information are also collected to evaluate the water quality status of lakes and reservoirs. Biological, chemical, and physical limnology data are collected to characterize baseline water quality conditions as shown in the table below:

Analytical Measurements for Lakes

PARAMETER GROUP	ANALYTES	FREQUENCY SEASON
Field Data	Dissolved oxygen (DO), conductivity, percent saturation (of DO), pH, Redox potential, sample depth, Secchi depth, temperature, and total dissolved solids	Quarterly
Algae	Chlorophyll_a, Pheophytin_a, algae identification	Summer only
Bacteria	*E. coli*	Quarterly
General Chemistry	Alkalinity, bicarbonate, carbonate, chloride, conductivity, dissolved organic carbon (DOC), fluoride, hardness, pH, sulfate, total dissolved solids(TDS), total organic carbon (TOC), total suspended solids (TSS), turbidity, volatile suspended solids (VSS)	Quarterly
Nutrients	Ammonia, biological oxygen demand (BOD), chemical oxygen demand (COD), phosphorus, nitrate/nitrite, total Kjeldahl nitrogen (TKN)	Quarterly
Metals (total and dissolved)	Cadmium, chromium, copper, lead, mercury, nickel, silver, zinc	Quarterly
Metals (total only)	Antimony, arsenic, boron, barium, beryllium, calcium, magnesium, manganese, selenium, thallium	Quarterly

Targeted Monitoring – As resources allow, surface water quality data are collected for a variety of other reasons during the assessment cycle. Frequently analytical measurements are limited at targeted sites to parameters of concern; however, if the investigation requires several months of monitoring, core parameters are collected to support future assessments of all designated uses. Targeted monitoring includes:

- TMDL development – Monitoring is a key activity in identifying sources and allocating pollutant load contributions to these sources in Total Maximum Daily Loads (TMDLs). The TMDL analysis starts with identification of the pollutants of concern and the water quality standards that must be attained to protect designated uses, including naturally occurring background conditions of the watershed;
- New standards or site-specific standards development;
- Complaint investigations;
- Antidegradation in "unique waters" –Not even limited degradation of water quality is allowed in these outstanding resource waters. (Eighteen Unique Waters have been established in Arizona's Surface Water Quality Rules (R18-11-112) and additional ones are proposed during the current Triennial Review.)
- Regional reference sites and regional curves – Macroinvertebrates samples, habitat information, and physical integrity measurements at collected at approximately 10 sites per year. Benthic macroinvertebrate samples are collected during the spring index period (April, May, or June) in wadeable, perennial streams.
- Filling in data gaps noted in past assessments, such as:
  - Exceedances resulting in an "inconclusive" assessment;
  - Missing core parameters;
  - Laboratory detection limits higher than standards;
  - Effectiveness monitoring needed due TMDL implementation projects and strategies.
- Long-term monitoring -- Approximately 28 fixed station sites have been monitored quarterly for almost 20 years with the goal of evaluating trends in water quality in Arizona's streams. These long-term fixed sites are on perennial streams located in all ten watersheds in the state (see map of fixed sites). ADEQ contracts with US Geological Survey to collect water quality monitoring at 19 of the 28 fixed sites, typically those on larger rivers with high annual flow.

If exceedances have occurred in the past, the monitoring design must ensure that monitoring represents critical conditions and critical locations (i.e., when and where exceedances occurred in the past, if those conditions still exist). Actually, water quality improvements may take years or decades after actions are taken, so the type of monitoring, site locations, and timing of the monitoring needs to be chosen carefully.

Fish Tissue Monitoring – In cooperation with the Arizona Game and Fish Department, ADEQ has been investigating human health risks associated with eating fish caught in Arizona's lakes. Recent monitoring has focused on two contamination issues: mercury and historic pesticides.

Surveys of mercury levels in fish tissue have resulted in fish consumption advisories for mercury being issued at: Alamo Lake, Arivaca Lake, Coors Lake, Upper and Lower Lake Mary, Long Lake, Lyman Lake, Soldiers Lake, Soldiers Lake Annex, Parker Canyon Lake, and Pena Blanca Lake. These surveys are on-going and further advisories are expected.

Fish consumption advisories have also been issued due to DDT metabolites, toxaphene, and chlordane contamination in the greater Phoenix area where these pesticides were historically applied to agricultural areas. Although no longer in use in Arizona, these pesticides are persistent in the environment, may bioaccumulate, and present toxic risks to human health and wildlife. ADEQ, AGFD, and U.S. Fish and Wildlife Service cooperate in conducting fish surveys for these pesticides.

Future Monitoring – ADEQ initiated a probability-based monitoring design in 2006, which uses randomly selected sites to infer conditions about the larger population (REMAP – Regional Environmental Monitoring and Assessment Program). For example, by randomly select sites among streams of a certain classification in a watershed, ADEQ should be able to assess all streams of that classification in that watershed. This would allow ADEQ to complete watershed-scale assessments. If reliable, these assessments may lead to watershed-scale impairment decisions.

New narrative biocriteria, habitat, fish tissue, and narrative implementation procedures are proposed during the current Triennial Review. When adopted, ADEQ plans to revise the Impaired Water Identification Rule to use these other measurements for assessment and listing decisions. However, these data sets were not used in the 2006 assessment.

Data Quality Assurance

Credible Data Requirements

A central objective of the assessment and 303(d) listing process is to identify impaired surface waters so that corrective actions can be taken. To accurately identify impairment, the data needs to be of high quality and must accurately reflect the surface water conditions. However, data potentially available to ADEQ are of varying quantity, quality, and age. Therefore, all readily available data are reviewed to determine whether they meet the credible data requirements in the Impaired Water Identification Rule for being credible and scientifically defensible, and that they are representative of water quality conditions. These requirements are clearly defined in the rule (A.A.C. R18-11-602) but can be summarized as follows:

- Data must be collected and analyzed following an appropriate Quality Assurance Plan (QAP) and Sampling and Analysis Plan (SAP), by adequately trained personnel using approved field and laboratory methods.
- Data must be evaluated to determine whether it is reliable, accurately reflects current water quality conditions, and valid. This is determined by considering factors such as:
    - Laboratory detection limits,
    - Lab notations or qualifiers,
    - Whether the sampling was representative and reproducible,
    - Whether approved sampling and analysis methods were used, and
    - Quality control of the data when collected and analyzed.
- The monitoring entity must submit documentation that these requirements have been met and other information necessary to assist ADEQ in interpreting and validating the data.

ADEQ is responsible for reviewing all data to ensure specified minimum quality assurance requirements are met. ADEQ must also review the adequacy of the QAP and SAP for the type of sampling undertaken. The rule provides ADEQ discretion in approving a QAP or SAP that does not contain all the required elements of R18-11-602(A) if ADEQ determines that the omitted element is not relevant to the sampling or its omission will not impact the quality of the results.

Technically, Arizona's credible data requirements apply only to the 303(d) listing process and not to the assessments of designated uses. Recognizing the federal mandate to consider all readily available data in making assessments, ADEQ decided that if the data could not meet credible data requirements, the following actions would be taken:

- The assessment unit would be assessed as "inconclusive" if this was the only data available for the assessment;
- The assessment unit would be added to the Planning List for future monitoring, and would be given higher priority for monitoring if an exceedance of standards had occurred; and
- A comment would be included in the assessment tables, indicating that other data was available and why the data were not used in the assessments.

Laboratory Reporting Limits and Standards

When the result is reported as less than the laboratory reporting limit and that value is above the standard, the sample is not included in the sample count. For example, if the result is reported as <5 mg/L and the standard is 2 mg/L, the result is not counted in the assessments. A comment is provided in the data gap report when this occurred.

Field Sampling Equipment Precision

Several water quality parameters have very short holding times for analysis or present a more accurate representation of conditions if measured in the field. The parameters include dissolved oxygen, pH, total residual chlorine, turbidity, and temperature. However, field measurements are often subject to more variability than other water quality measurements. Imprecision is addressed in the field through quality assurance/quality control procedures (e.g., calibration of the field equipment, placement of the instrument in the stream); however, other variations are inherent in natural systems and in the nature of the equipment used for testing.

Studies have shown that most aquatic organisms can tolerate small fluctuations over short periods of time for conventional water quality parameters without damaging effects. Therefore, the following field equipment tolerance values are used based on a survey of manufacturer's specification for accuracy in field equipment currently in use by ADEQ:

- pH ± 0.2 standard units
- Dissolved oxygen ± 0.2 mg/L
- Turbidity ± 2 NTU

For assessment purposes, this means that if the dissolved oxygen standard was 6.0 mg/L, a sample reported at 5.8 mg/L would not be counted as an exceedance. This practice acknowledges the tolerance range of the equipment available for these measurements. These tolerance values will be reviewed with each assessment cycle so as field equipment becomes more reliable, exceedances can accurately be called closer to the standard.

Precision in *E. coli* Results

Both lab and field bacterial analyses provide an estimation of bacterial density, reported in terms of a "Most Probable Number" (MPN). For example, using the multiple tube technique, if the result is reported as 240 colony forming units (CFU), there is a 95% confidence level that the result is between 100 and 940 CFU (*Standard Methods for Examination of Water and Wastewater, 20th Edition*).

303(d) listing decisions are not based on results reported relatively near the single sample maximum standards of 235 CFU (for Full Body Contact) or 576 CFU (for Partial Body Contact). Instead, screening values of 300 and 630 CFU, respectively, are used for impairment decisions, so that minimum exceedances must be above these screening values.

For assessment purposes, all results above the standard are reported as exceedances in the assessment report; however, a comment is made when the result is below the screening value.

Sample Values Less Than the Laboratory Reporting Limit

In the absence of pollutants or when pollutant concentrations and loadings are minimal, the results of a water sample analysis may be reported to be below the analytical method detection limit, which is reported as "not detected," "non-detect", or "less than." When the value is reported as not detected, we only know that the value is less than the applied technology can measure. The true value cannot be determined.

The Impaired Water Identification Rule (A.A.C. R18-11-603.A.1.b) establishes how these data will be used. In some cases, the reporting limit is below the standard (e.g., the standard is 5 mg/L and result is <3 mg/L). In these cases, the data are meeting the water quality standard and should be used for assessment and listing purposes. The rules further describe that "less than" data can be used in trend analysis, descriptive statistics, or modeling as follows:

- If there are sufficient data to support statistically estimating the values reported as "less than" the reporting limit; or
- If there are not sufficient data to support statistically estimating the values reported as "less than" the reporting limit, then ADEQ will use one-half of the value of the RL.

If the reporting limit is *above* the standard and the laboratory result is at or below the reporting limit, the results *cannot* be used for a listing decision. For example, if the result is <8 mg/L and the standard is 5 mg/L, whether or not the analytical result exceeded the criteria is not known. The samples are not used in the assessment.

Reviewing Dissolved and Total Standards

Where only the *dissolved* fraction was analyzed (no total measurement), the dissolved result is compared to the "total" standard. Given the total value should equal the dissolved fraction plus any suspended portion, the dissolved fraction could equal but should not exceed the total standard.

In those cases where both total and dissolved fractions are provided, but the dissolved fraction is above the total value, the data is flagged as unreliable for listing decisions if the dissolved fraction is more than 10% higher than the total fraction.

ADEQ does not attempt to translate total results into estimates of the dissolved form because EPA has not provided a standardized methodology to use. When such methods become available, they will need to be reviewed to determine their reliability and applicability to the assessment and 303(d) listing process in Arizona.

Data Qualifiers

Water quality data and information may include data qualifiers or field comments that denote a deviation from acceptable sampling, handling, storage, or analytical procedures. Some data qualifiers invoke questions as to the accuracy of the data in representing the actual water quality conditions. For example, values reported by the laboratory as *estimates* are not used for listing decision. A case-by-case evaluation of the lab qualifiers is used to determine the reliability of the data.

Data Management

ADEQ tracks surface water quality data used in this assessment, including data collected by outside agencies, in an Oracle database. Surface water quality data is tracked by sites and related to an assessment unit. Data is routinely uploaded from this database to EPA's STORET system, a national repository of water quality information to facilitate public access to ADEQ's data.

Assessment Unit Delineation and Identification

An assessment unit is the delineated lake or stream reach being evaluated. A stream reach was derived from EPA's Reach File System which divided a stream into segments based on intervening tributaries. Over the years, these reaches have been further segmented to reflect changes in designated uses or differences in impairment.

Each assessment unit is assigned a unique number (e.g., 15060202-028) as shown in the figure to the right, using the 8-digit hydrologic unit code number (HUC) assigned by the National Resources Conservation Service (NRCS) for the drainage area, and

- A 3-digit stream reach number (derived from EPA's original Reach File System), or
- A 4-digit lake number (derived from Arizona Game and Fish Department's lake numbering system).

Reach 15060202-028 is also verbally delineated in the assessment report by tributaries or other boundaries. In this case, the assessment unit is *Sycamore Creek, From Garland Spring Wash to Tule Canyon.*

Site Identification

Surface water quality monitoring sites are identified in the database by their location along a stream or lake. Instead of using the latitude and longitude number for the site, ADEQ has devised a more user-friendly identification system using:

- Watershed code,
- Stream/lake code,
- A river mile number (miles upstream from the mouth of the stream) or
- Lake site descriptive code.

For example, on the reach used in the above example, a site identification number could be "VRSYW001.28." This ID indicates that the sample was collected in the Verde Watershed (VR), on Sycamore Creek (SYW), and 1.28 miles upstream from its confluence. This ID number provides a wealth of information for those who know how to decode it.

A similar coding system is used for lakes, except that the river mile system is replaced by a descriptive site code. The lake site ID "SCLAK – A" indicates that the site is in the Santa Cruz Watershed (SC), on Lakeside Lake (LAK), and at location A, which is usually the dam site. The location code generally follows this pattern:

A = Dam site
B = Mid lake
MAR = Marina
BR = Boat Ramp

Arizona Assessment Calculator (AZAC)

AZAC is a computer module developed for ADEQ by Tetra Tech, Incorporated to help automate assessments of data housed in ADEQ's database. In Phase I, the data was aggregated into 7-day intervals per site, data reliability issues were flagged, and exceedances of surface water quality standards were determined. Reports derived by AZAC were used for the first time in the 2006 assessment. Later phases are proposed to take the assessment process further, ultimately automating assessment reports.

Electronic Assessment Reporting to EPA

After the EPA approves the final 303(d) List, ADEQ sends its assessments to a federal Assessment Database (ADB). This provides an electronic version of the assessment report, which is compiled by EPA with other state reports to create the national report to Congress on the status of water quality. Assessments are recorded for each designated use. Pollutants/stressors causing impairment and probable sources are identified for all impaired waters. The status of TMDL development is also tracked in this database to develop national statistics.

ADEQ also sends a Geographic Information System (GIS) cover of the assessed waters to EPA with its electronic assessment. The new National Hydrography Dataset (NHD) is now being used to define the geographic location of assessment units. Attributes in the NHD, such as a reach number and the stream code abbreviations, are also used in the Department's Oracle database to identify the sites and surface waters.

SECTION 3
DATA INTERPRETATION AND ASSESSMENT CRITERIA

Data Interpretation

Exceptions for Exceedances

Not all exceedances of a water quality criterion result in an assessment unit being identified as impaired. Certain situations are specifically exempted in the surface water quality standards or the Impaired Water Identification Rule as not applicable in determining impairment. Surface waters are not assessed as impaired when:

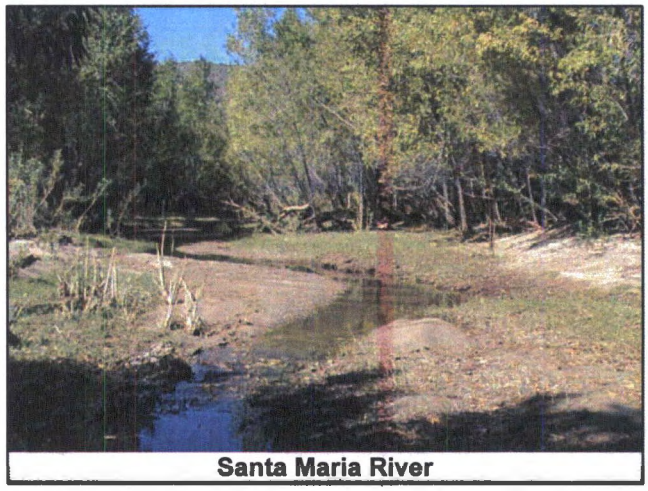
- Pollutant loadings from naturally occurring conditions alone are sufficient to cause a violation of water quality standards (A.A.C. R18.11.604.C(1));
- Water quality results were collected under a moderating provision of an NPDES/AZPDES permit, such as a mixing zone, and the result does not exceed any discharge limitation established in the permit (A.A.C. R18-11-604.C.(2)); or
- The non-attainment is due to an activity or situation exempted under the surface water quality standards in R18-11-117 (canals and municipal park lakes), R18-11-118 (dams and flood control structures) or R18-11-119 (natural background).

If an assessment unit is impaired solely due to naturally occurring conditions (no human-caused influences), the surface water is not listed based on the exemption provided by A.A.C. R18-11-119. However, if there is evidence that the surface water is impaired due to naturally occurring conditions *and* as a result of human activity, the Department will place the surface water on the 303(d) List for further investigation to determine what portion of the impairment is "natural" versus what is human-induced and therefore, eligible for reduction and allocation under a TMDL analysis.

The TMDL investigation can also determine whether a site-specific standard or use-attainability analysis should be developed to address the naturally occurring pollutant loadings. 40 CFR 131.10(g) provides that site-specific criteria can be adopted when waters cannot attain standards because of naturally occurring pollutant concentrations or legacy pollutants. However, the human-caused impacts would be subject to reduction and/or remediation through the TMDL process to bring the water quality back into attainment of the pollutant concentrations that would naturally occur.

The most common reasons for exempting exceedances due to the "natural conditions" exception are:

- Low dissolved oxygen occurring where the source of the flow is primarily ground water upwelling, which is naturally low in dissolved oxygen. In most cases, flows at these sites were less than 1 cfs. In such cases, the monitoring and assessment staff must document:
  - No obvious anthropogenic sources of nutrients which would use the oxygen (e.g., septic systems, point source discharges upstream, grazing, recreation);
  - No evidence of excess nutrients (algal blooms);
  - That ground water was the primary source of flow.
  - Where data are available, nitrogen concentrations are less than 0.5 mg/L (i.e., much lower than standards and typical of levels found in unimpacted or native ground water); and
  - Bacterial standards were not exceeded.



Santa Maria River

- High pollutant loading from a spring source, with no potential anthropogenic sources of the pollutant due to factors such as access, topography, geology, and restrictions established by the land management agency (e.g., spring fed reaches in the Grand Canyon tributaries).

Applying Narrative Standards

EPA has long suggested that all states develop implementation procedures for narrative water quality standards. Arizona's TMDL statute requires development of narrative implementation procedures before narrative water quality standards can be applied to 303(d) listing decisions (A.R.S. §49-232F). Several of these documents (e.g., narrative nutrients, narrative toxicity, narrative bottom deposits/sediment, and antidegradation) are currently under development, but were not available for this assessment; therefore ADEQ could not place an assessment unit on the 303(d) List based on evidence of narrative standard violations. If evidence of a narrative standard violation is present, the designated use is assessed as "inconclusive" and the assessment unit is placed on the Planning List for further monitoring. For assessment purposes, evidence of narrative standard violations would include:

- Fish kill related to algal blooms, low dissolved oxygen, high pH, or pollutants;
- Fish consumption advisory issued for a specific assessment unit; or
- Swimming area closure due to bacteria or other pollutant.

Narrative standard implementation procedures will establish not only the type of evidence, but the amount and magnitude of evidence needed to determine whether a narrative standard is being violated and whether the surface water should be added to the 303(d) List. For example, would one fish kill merit listing? Perhaps if, for example, an algal bloom, low dissolved oxygen, and high pH were also occurring.

The list of needed narrative implementation procedure documents outweighs current resources for development. As noted above, ADEQ is focusing its initial efforts on several key narrative standards:

- Narrative nutrients for lakes;
- Narrative toxics, including criteria and process for issuance of fish consumption advisories and the role of toxicity testing in both NPDES/AZPDES permits and ambient monitoring;
- Narrative bottom deposits/sediment;
- Narrative bioassessment criteria; and
- Antidegradation.

It is envisioned that implementation procedure documents will address use of the standard in permitting, assessments, listing decisions, and compliance determinations.

Weight of Evidence

While minimum data requirements are important to establish, it would not be wise for the Department to make assessments blindly, based on numbers alone. There are many other factors that can be considered when making an impairment decision. A true weight-of-evidence approach considers multiple environmental indicators (biological, toxicological, physical, and chemical measurements) in assessing water quality. However, the 303(d) listing decisions are based primarily on chemical-physical measurements with numeric water quality standards, because until narrative standard implementation procedures are adopted, the TMDL Statute (**Appendix B**) precludes the use of narrative standards or biocriteria in listing decisions. Given this deficiency in the rules governing listing decisions, how does ADEQ use the weight-of-evidence approach for assessment and listing?

The weight of evidence approach in R18-11-605(B) (**Appendix C**) allows ADEQ to consider contextual information during the assessment process, such as:

- *Data Quality* –Newer or more reliable data is given more weight than data where quality is more questionable, especially where two different datasets may indicate conflicting results;
- *Critical Conditions* – Data collected during critical conditions may be considered separately from the complete dataset (critical conditions are those conditions during which exceedances are most likely to occur based on past occurrences);
- *Evidence of toxic impacts* – Fish kills, fish consumption advisories, beach closures, bioaccumulation in prey species, and other evidence of toxic impacts;
- *NPDES/AZPDES information* – Water quality discharge data or compliance issues with the pollutant of concern;

- *Anthropogenic influences* – Activities in the watershed, especially adjacent to an assessment unit, that might be the source of a pollutant;
- *Natural conditions and characteristics of the pollutant* – Geomorphology, geology, hydrology, and characteristics of the pollutant are considered when establishing whether the exceedance was solely or primarily due to natural conditions or whether human activities may be contributing to the exceedance, or provide other support for listing decision; and
- *Upstream or downstream exceedances* – The existence of other narrative or numeric exceedances can also provide supporting evidence.

For example, flow conditions are a crucial piece of information when reviewing the data in lotic waters (streams and rivers). In the absence of precipitation, streams are subject to extreme low flows (i.e., 1Q10, 7Q10), as opposed to high flow events (floods) that occur in response to significant rain or other precipitation events. Along with precipitation, or the lack thereof, in some systems stream flow volume is regulated by impoundments and diversions to accommodate irrigation, industrial cooling water, or hydroelectric needs. Low flows may be the critical conditions when an adit or other point source discharge is the primary source of pollutant loadings.

More variable and less predictable are the high flows resulting from precipitation events. Duration, frequency, magnitude, time of year, land use, and applied treatments are all factors that influence the impact a precipitation event may have on stream flow volume and corresponding water quality. For nonpoint sources of pollutants, high flow conditions will frequently result in pollutant loading from the watershed.


Flood Flow on Big Sandy River

Another issue during flood flows is bacterial contamination. Exceedances of standards should be expected, especially during the initial flush of highly turbid runoff. Listing an assessment unit as impaired and doing a TMDL analysis due to such contamination would be a fruitless waste of resources. Therefore, using the weight-of-evidence approach, listing may be delayed while other samples are collected.

Based on evidence of narrative exceedances or toxic impacts, assessment units are given higher priority for future monitoring, even though no numeric standard violations were reported. In addition, EPA in its review of the report can choose to list additional waters based on information provided in the report. This is especially true where the state is precluded by law from using certain types of information in its assessment decisions.

These factors do not, however, supersede any minimum data requirements. Also, a single line of water quality evidence is sufficient to demonstrate that the assessment unit is impaired.

Representative Data

Appendix B of the CALM guidance (EPA, 2002) discusses the issue of representativeness of a site. It finds that samples taken close to each other in space tend to produce like results, as do samples taken close together in time. The best way to ensure that data is representative is to collect samples using an unbiased selection method with sufficient independent sampling sites to capture the variability inherent in surface water.

Methods for determining whether data are representative, reliable, and reproducible must be established in the data quality objectives established for the monitoring data in the Quality Assurance Plan (QAP) and Sampling Analysis Plan (SAP). ADEQ reviews the QAP and SAP as part of the credible data determination.

Unrepresentative sampling may occur as a result of selectively sampling from more accessible locations or even by excluding all storm event data. Non-representative data would also include water quality data collected at the end of a pipe, in street storm water drains, or in runoff outside of the stream channel.

Water collected in standing pools or in storm flow conditions would be representative of the variation in stream conditions. Such samples would need to meet surface water quality standards. However, if a large proportion of the data is collected during extreme high flow events, the dataset will be skewed and force the Department to establish unrealistic load reduction goals to account for such infrequent events. Therefore, ADEQ strives to collect data during a variety of flow conditions and performs assessments using a weight-of-evidence approach. During the assessment, samples collected during extreme high flow events are noted, if documented, and considered appropriately under the weight-of-evidence approach.

Monitoring the San Pedro River

Rather than define the maximum coverage of a single station, Arizona's Impaired Water Identification Rule relies on minimum numbers of samples, spatial independence, and temporal independence. Samples are considered ***spatially independent*** if they are collected more than 200 meters apart; or if less than 200 meters apart, samples were taken to characterize the effect of an intervening tributary, outfall, pollution source, or significant hydrographic or hydrologic change. Samples are ***temporally independent*** if they are collected at least seven days apart (see 7-day Rule below).

Data Aggregation

The Seven-Day Rule

Temporal separation of samples is important in the assessment process, because surface waters should be identified as impaired only if the exceedances of water quality standards are persistent or recurring. Impairment decisions should not be based on one-time events that cause a temporary elevation in pollutant concentrations that may never be repeated. Similarly, a decision of "attaining" should also not be made based on samples collected all at one time.

In order to ensure temporal separation of samples, the Department assumes that samples collected at a site within seven days represent one "event." Then the Department determines that multiple dates are represented by combining sites within the assessment unit. So, the following two steps occur in the process of data aggregation to ensure that samples are temporally independent.

Step 1 – Sample counting by site

If multiple samples are available *at one site* within a seven-day period, a representative value is determined. This value is then counted as one sample for that one-week period at that site. The following values are used:

7-Day Data Aggregation Criteria

PARAMETERS	REPRESENTATIVE 7-DAY VALUE
Dissolved oxygen	Minimum value
Acute aquatic and wildlife criteria Nitrate and nitrate/nitrite criteria *E. coli* single sample maximum standard	Maximum value
Chronic aquatic and wildlife criteria	Use the median value for the 7-day period. (If an even number of samples, select the maximum of the central two numbers.)
pH	Minimum or maximum (the pH standard is a range of numbers)
All other data*	Measure of central tendency (usually an average)

Step 2 – Sample counting by assessment unit
If multiple sites have been sampled within the assessment unit within a seven-day period, they are counted as one sample and one exceedance for the assessment unit unless:

Exception 1: Applying 90th Percentile standards to nutrient data; or
Exception 2: Applying geometric mean standards to *E. coli* bacteria data.

The table below provides an example of what occurs during the two steps of data aggregation. The acute Aquatic and Wildlife criterion for selenium is used for the example (20 µg/L). In this table, exceedances appear in red type. Samples collected during the same week are shaded purple. The third column shows the results of data aggregation by site (Step 1). At Site 1, three samples were collected within a seven-day period, so the worst case value is used as the representative value for that week. All other samples were collected at least a week apart; therefore, the sample values are simply brought over into the Data Aggregation column. The number of samples and exceedances are counted the assessment unit (Step 2). In this step all samples 4/10/03 and 4/13/03 are counted as one sample and one exceedance.

Example of 7-Day Data Aggregation Methods

	Actual Samples Collected		Data Aggregation by Site (Step 1)	Data Aggregation by Assessment Unit (Step 2)
	Date	Selenium (µg/L)		
Site 1	4/10/03	27	Worst case value 4/10/03 – 4/13/03 = 29	
	4/12/03	29		
	4/13/03	<5		
	6/7/04	18	18	
Site 2	1/11/03	15	15	
	4/12/03	22	22	
	7/17/03	18	18	
	11/20/03	<5	<5	
Assessment Unit			6 samples 2 exceedances	(Data on 4/12/2003 combined) 5 samples 1 exceedance

In Step 1 a representative value, such as an average or a worst case, is being determined for the assessment unit. In Step 2, all samples for a parameter collected within a week at multiple sites are *counted as one sample*. If any one of the samples or representative values in a seven-day period is an exceedance of a standard, it is *counted as one exceedance*.

This data aggregation avoids over-counting exceedances (a type 1 error that would lead to listing when not impaired) and avoids over-counting samples collected during one week that could dilute out a problem (a type 2 error that would lead to not listing when impaired).

Critical Sites

However, data or information collected at one or more sites may be considered separately from the complete dataset, when the data show that the assessment unit is impaired at those sites, but attaining at other sites. In such cases the data is not aggregated across the assessment unit. Not aggregating data in such cases avoids a type 2 error (failure to list when impaired).

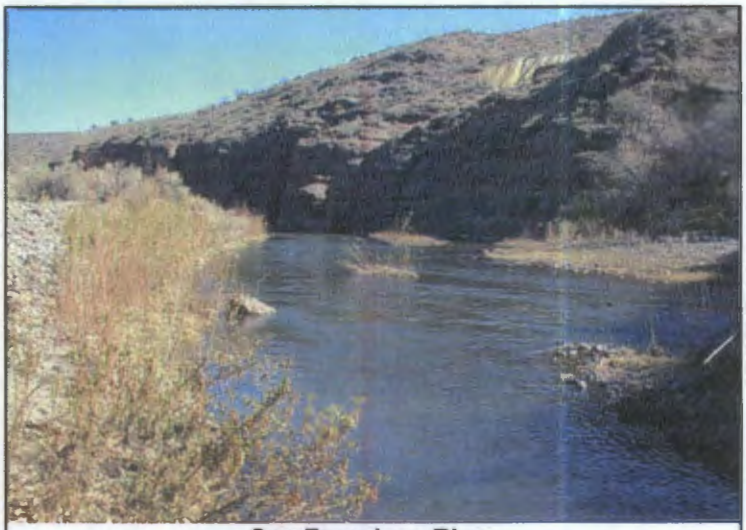
Assessing Attainment

Assessing attainment of standards and assessing impairment of an assessment unit are two entirely different decision processes. Consider a toxic pollutant, such as copper, as an example. The acute dissolved copper standard for the Aquatic and Wildlife use is not to be exceeded more than one time in a three-year period. This criterion for impairment is based on EPA guidance, which cites studies showing that aquatic life can recover from only one exceedance during this time period.

Assuming that one day equals one exceedance, to demonstrate attainment of this standard, ADEQ would need to show that *all areas* of the assessment unit *attained* the standard 1,093 days out of approximately 1,095 total days in a three-year period. To demonstrate impairment, the Department would need to show only that *any one site* in the assessment unit *exceeded* the standard two days out of 1,095 days. Thus, while two samples for one pollutant are sufficient to show impairment, the same cannot be said for determining attainment.

The Department cannot monitor every surface water, or even one surface water, every day for three years. Even with unlimited resources, it would not make sense to spend this much time monitoring one assessment unit when there are no indications of water quality problems. This would only delay the monitoring of other surface waters where impairment may be occurring.

For these reasons, EPA guidance recommends that states choose a set of "core indicators," and a minimum number of samples, necessary to assess *attainment* of designated uses. ADEQ has adopted this approach.



San Francisco River

Core Parameters and Seasonal Distribution

Ideally, samples would be collected continuously from all possible monitoring sites along an assessment unit to avoid extrapolation of data in assessing water quality. Also, all parameters with surface water standards would be included routinely in the analytical suite. However, this level of data collection and analysis is never possible. Given staff and budget constraints, monitoring data are instead collected at sites and during conditions selected to be representative of the varying conditions. Since a water quality standard might be more likely to be exceeded during critical conditions such as high or low flows, or during seasonal conditions when recreation is more active, samples should be collected under different conditions to determine whether the surface water is really "attaining" it designated uses (seasonal distribution).

Although all parameters with numeric standards are used for assessment, ADEQ has chosen a set of indicators, called "core parameters," necessary to assess whether each designated use is *attaining* standards. Arizona's core parameters are shown in the table below.

Core Parameters

DESIGNATED USE	CORE PARAMETERS
Aquatic and Wildlife	Dissolved oxygen (not required if ephemeral) Stream flow (if a stream) Sample depth (if a lake) pH Total nitrogen (if nutrient standards established) Total phosphorus (if nutrient standards established) Dissolved cadmium, copper, and zinc and hardness
Fish Consumption	Total mercury
Full Body or Partial Body Contact	*Escherichia coli* (not required if ephemeral) pH
Domestic Water Source	Nitrate/nitrite or nitrate pH Fluoride Total arsenic, chromium or chromium VI, and lead
Agricultural Irrigation	pH Total boron and manganese
Agricultural Livestock Watering	pH Total copper and lead

Core parameters were selected based on EPA's CALM guidance (2002), although they are limited due to the lack of narrative standards implementation procedures. CALM guidance places strong emphasis on narrative water quality standards, suggesting that core indicators should include bioassessments, habitat assessments, ambient toxicity testing, contaminated sediment, health of individual organisms, nuisance plant growth, algae, sediments, and even odor and taste. However, Arizona is currently limited to physical-chemical parameters. Arizona's choice of core parameters will change in future assessments as new numeric and narrative standards, criteria, and assessment tools are developed.

Core parameters were chosen using the following criteria:

- Frequently exceeded standards in past assessments;
- Routinely included in ambient monitoring suites;
- Lab reporting limits routinely below applicable surface water criteria;
- Critical toxicity recognized; and
- Standards and implementation procedures support application of the criteria.

For example, dissolved metals exceedances and low pH measurements are often found in historic mining areas. *E. coli* bacteria and nitrate were chosen because they can cause serious human illness or death if standards are exceeded, and they are important in determining support of Body Contact and Domestic Water Source designated uses.

Core parameters must be sampled at least *three times* and samples must be reasonably distributed at different times of the year to reflect seasonal changes (seasonally distributed). If this does not occur, and the designated use is not "impaired," then the designated use is assessed as "inconclusive."

Attainment decisions are not limited to these core parameters. All parameters with surface water quality criteria are considered. For example, along with the *E. coli* and pH samples (the two core parameters for Full Body Contact), the Full Body Contact criteria for metals (e.g., arsenic, cadmium, zinc) must also be considered when data is available. The assessment unit would be assessed as "attaining" Full Body Contact when all applicable criteria showed attainment.

To assess a designed use, all core parameters must be represented seasonally. For example, although numerous *E. coli* bacteria samples were collected, the assessment unit is assessed as *attaining* Full Body Contact only if pH was also collected with seasonal distribution.

Note that core parameters and seasonal distribution are not required to determine *impairment* (see the **Assessing Impairment** subsection to follow).
The Department acknowledges that three sampling events are not enough to assess *attainment* with *statistical* confidence. However, three seasonally distributed samples with no exceedances indicate that monitoring resources may be better spent at other sites. Such attainment decisions reflect limited monitoring resources and the Department's focus on identifying and resolving water quality impairments.

Assessing Impairment

Minimum Data Requirements

As described above, determining impairment requires fewer samples than determining attainment. Especially for the most toxic pollutants, it takes very few exceedances to cause impairment of a designated use. Also, while it takes several parameters to assess attainment, it takes only one pollutant to cause impairment.

When trying to identify water quality problems, a larger dataset will often have a higher probability of detecting water quality criteria excursions than smaller datasets. However, as noted previously, resources restrict sampling efforts to the minimum needed to fulfill data quality objectives. Preparation of the 303(d) List and TMDLs must account for the varying quantities of data and associated confidence in that data to identify water quality concerns.

The Department understands the importance of data quantity in the water quality assessment process; however, staffing, budgets, and time often restrict the amount of data collected from a single assessment unit. Furthermore, EPA guidance calls for states to explore ways to achieve the most practical statewide coverage which translates to fewer measurements from a greater number of surface waters and use of extrapolation methods.


Little Colorado River – Suspended Sediments

For most criteria, the Impaired Waters Identification Rule (**Appendix C**) requires a minimum of 20 samples collected over three sampling events to determine impairment. This is based on a greater than 10% exceedance rate at a 90% confidence level, and is referred to as the "binomial approach." Exceptions to the 20-sample minimum are established in the rule and discussed below, but generally involve exceedances of criteria with acute human or aquatic life impacts (e.g., bacteria, toxics). Waters that are lacking sufficient data to determine if a designated use is "attaining" or "impaired" are placed on ADEQ's internal Planning List for future monitoring.

The following tables summarize the assessment criteria used to determine that a designed use is "impaired," "attaining," or "inconclusive." The methods for impairment determination vary by type of criteria and potential toxicity of the pollutant. A pollutant that exceeds an acute aquatic and wildlife standard even once, for example, may be lethal to aquatic life and wildlife. On the other hand, some of the human health standards were set at levels that protect for lifetime exposures.

Assessment Criteria Summary Table

	EXCEEDANCE DEFINITION	ASSESSED AS		
		IMPAIRED	ATTAINING	INCONCLUSIVE
ALL HUMAN HEALTH AND AGRICULTURE USE CRITERIA **Body Contact, Fish Consumption, Domestic Water Source, Agriculture Irrigation, Agriculture Livestock Watering** **(Except those addressed below)**	1 exceedance = 1 grab sample exceeds a criterion	At least 10% of samples exceed criterion at a 90% confidence rate; Minimum of 5 exceedances; and Minimum of 20 samples (See following binomial-based table)	No exceedances or fewer exceedances than criteria for planning list (See following binomial-based table); and If a core parameter, at least 3 samples representing different seasons	If an exceedance, insufficient data to determine if impaired to attaining (see criteria to left); or Insufficient core parameter samples or seasonal coverage.
ACUTE CRITERIA **Aquatic and Wildlife**	1 exceedance = 1 grab sample exceeds a criterion	Two or more exceedances during a 3-year period	No exceedances during the last 3 years of monitoring; and If a core parameter, at least 3 samples representing different seasons	Only one exceedance during the last 3 years of monitoring; or Insufficient core parameter samples; or Insufficient seasonal coverage
CHRONIC CRITERIA **Aquatic and Wildlife**	1 exceedance = 1 grab sample exceeds a criterion and absence of contextual information indicating unstable conditions; or The median value of at least 4 samples taken 24 hours apart exceeds a criterion	Two or more exceedances during the assessment period	No exceedances of any A&W chronic criterion during the assessment period; and If a core parameter, at least 3 samples representing different seasons	Only one exceedance during the assessment period; or Insufficient core parameter samples; or Insufficient seasonal coverage
NITRATE OR NITRATE/NITRITE CRITERIA **Domestic Water Source**	1 exceedance = 1 grab sample exceeds a criterion	Two or more exceedances during the assessment period	No exceedances (Not a core parameter)	Only one exceedance during the last 3 years of monitoring. (Not a core parameter)
***E. COLI* BACTERIA SINGLE SAMPLE MAXIMUM CRITERIA** **Body Contact**	1 exceedance = 1 grab sample exceeds a single sample maximum criterion. However, for impairment decisions, the grab sample must exceed a screening value.	Two or more exceedances during the assessment period	No exceedances; and If a core parameter*, at least 3 samples representing at different seasons	Only one exceedance during the last 3 years of monitoring; or Fewer than three samples*; or Insufficient seasonal coverage*
***E. COLI* BACTERIA GEOMETRIC MEAN CRITERIA** **Body Contact**	1 exceedance = the geometric mean of at least 4 samples taken during a 30-day period exceeds a criterion	Two or more exceedances during the assessment period	No exceedances (Sufficient data to calculate a monthly geometric mean is not required)	Only one exceedance during the assessment period.
NITROGEN AND PHOSPHORUS SINGLE SAMPLE MAXIMUM CRITERIA **Body Contact and Aquatic and Wildlife**	1 exceedance = 1grab sample exceeds a criterion	At least 10% exceedance at a 90% confidence rate; Minimum of 5 exceedances; and Minimum of 20 samples (see binomial-based table below)	No exceedances or fewer exceedances than criteria for planning list (see binomial-based table below); and If standards apply, at least 3 samples represented different seasons	At least one exceedance, but insufficient data to determine if impaired to attaining (see criteria to left); or If standards apply, fewer than 3 samples collected or insufficient seasonal coverage
NITROGEN AND PHOSPHORUS ANNUAL MEAN CRITERIA **Body Contact and Aquatic and Wildlife**	1 exceedance = the annual mean of at least 3 monthly means exceeds a criterion	Two or more exceedances during the assessment period	No exceedances (Sufficient data to calculate an annual mean is not required)	Only one exceedance during the assessment period; or Many samples exceeded the criterion although the annual mean was not exceeded.
NITROGEN AND PHOSPHORUS 90th PERCENTILE CRITERIA **Body Contact and Aquatic and Wildlife**	1 exceedance = the 90th Percentile of at least 10 samples collected at least 10 days apart exceeds a criterion.	Two or more exceedances during the assessment period	No exceedances (Sufficient data to calculate a 90th Percentile is not required)	Only one exceedance during the assessment period; or Many samples exceeded the criterion although the 90th Percentile was not exceeded.

	EXCEEDANCE DEFINITION	ASSESSED AS		
		IMPAIRED	ATTAINING	INCONCLUSIVE
SUSPENDED SEDIMENT CONCENTRATION GEOMETRIC MEAN CRITERION **Aquatic and Wildlife**	1 exceedance = the geometric mean of at least 4 consecutive samples exceeds the criterion, excluding samples collected during elevated flows. (See discussion in Data Interpretation.)	Two or more exceedances during the assessment period	No exceedances (Sufficient data to calculate a geometric mean is not required)	Only one exceedance during the assessment period; or Many samples exceeded the 80 mg/L criterion although the geometric mean was not exceeded.
TOTAL DISSOLVED SOLIDS FLOW-WEIGHTED ANNUAL MEAN CRITERIA **On the Colorado River**	1 exceedance = the flow-weighted mean of all samples collected during a 12 month period exceeds a site-specific criterion.	Two or more exceedances during the assessment period	No exceedances (Sufficient data to calculate a flow-weight mean is not required)	Only one exceedance during the assessment period; or Many samples exceeded the criterion although the annual mean was not exceeded.

* E. coli bacteria and dissolved oxygen are not required core parameters where Aquatic and Wildlife ephemeral and Partial Body Contact apply.
Note: If not a core parameter, no minimum samples are required to determine that a designated use is "attaining."

Binomial-Based Exceedance Table

SAMPLES COLLECTED		MINIMUM EXCEEDANCES		MAXIMUM EXCEEDANCES
FROM	TO	IMPAIRED (Binomial)	INCONCLUSIVE (Planning List)	ATTAINING
3	9	NA	NA	0
10	15	NA	3	2
16	19	NA	4	3
20	23	5	4	3
6	32	6	5	4
33	40	7	6	5
41	47	8	7	6
48	55	9	8	7
56	63	10	9	8
64	71	11	10	9
72	79	12	11	10
80	88	13	12	11
89	96	14	13	12
97	104	15	14	13
105	113	16	15	14
114	121	17	16	15
122	130	18	17	16
131	138	19	18	17
139	147	20	19	18
148	146	21	20	19
157	164	22	21	20

To determine impairment, the minimum number of exceedances is based on a minimum of 10% exceedance frequency with at least a 90% confidence level, using a binomial distribution. If not impaired, an assessment unit is placed on the Planning List based on a 10% exceedance frequency with a minimum of 80% confidence level, also using a binomial distribution. Attainment occurs if sufficient samples to assess and insufficient exceedances to place on the planning list. Formulas to determine the minimum exceedances with any number of samples are included in Appendix C (Impaired Water Identification Rule, R18-11-605).

Assessing When No Longer Impaired

When is an assessment unit no longer impaired? What is the minimum number of samples? What number of exceedances is acceptable? The Impaired Water Identification Rule **(Appendix C)** currently provides limited criteria to determine when an assessment unit is no longer impaired (R18-11-605(F)). More specific criteria are proposed in the draft Impaired Water Identification Rule, but these criteria were not applied in the 2006 assessment.

An assessment unit is removed from the 303(d) List when the TMDL is completed or alternative pollution control requirements have made the development of a TMDL unnecessary. In EPA's terms, the surface water is moved from Category 5 to Category 4A or 4B, but it remains *impaired.*

To be "no longer impaired," one of the following criteria must be met:

- The water quality criterion is no longer exceeded due to a change in standard or designated use;
- New data indicate that the designated use is attaining, and the new data was collected during critical conditions (hydrologic or climatic conditions when exceedances are most likely to occur);
- Reevaluation of the assessment information indicates an error or deficiency in the original analysis resulted in an inappropriate listing;
- Pollutant loadings from naturally occurring conditions are the sole cause of the criterion not being met; or

- The reach is split into 2 or more segments and no current or historic data exists that would support listing this portion of the impaired reach.

If the delisting is based on new data, then the number of samples required and the number of exceedances depend on the criteria used for listing, as shown in the following table:

Criteria for Determining When No Longer Impaired

	ASSESSED AS NO LONGER IMPAIRED	EXCEEDANCE DEFINITION
ALL HUMAN HEALTH AND AGRICULTURE USE CRITERIA (Except those addressed below)	Minimum 10 samples and no more than the maximum exceedances shown in "Attaining" column in the binomial-based table (prior page)	1 exceedance = 1 grab sample exceeds a criterion
ACUTE CRITERIA Aquatic and Wildlife	No exceedances during the last three years of monitoring the parameter of concern	1 exceedance = 1 grab sample exceeds a criterion
CHRONIC CRITERIA Aquatic and Wildlife	No exceedances during the assessment period and parameter of concern samples were collected.	1 exceedance = 1grab sample exceeds a criterion and absence of contextual information indicating unstable conditions; or The median value of at least four grab samples taken at least 24 hours apart during a 7-day period exceeds a criterion
NITRATE OR NITRATE/NITRITE CRITERIA Domestic Water Source	No exceedances during the last three years of monitoring the parameter of concern	1 exceedance = 1 grab sample exceeds a criterion
***E. COLI* BACTERIA SINGLE SAMPLE MAXIMUM CRITERIA** Body Contact	No exceedances during the last three years of monitoring the parameter of concern	1 exceedance = 1 grab sample exceeds a single sample maximum criterion
***E. COLI* BACTERIA GEOMETRIC MEAN CRITERIA** Body Contact	Sufficient samples to determine at least two monthly geometric means and no exceedances	1 exceedance = the geometric mean of at least 4 samples taken during a 30-day period exceeds a criterion
NITROGEN AND PHOSPHORUS SINGLE SAMPLE MAXIMUM CRITERIA Body Coutact and Aquatic and Wildlife	Minimum 10 samples and no more than the maximum exceedances shown in the "Attaining" column in the binomial-based table (prior page)	1 exceedance = 1 grab sample exceeds a criterion
NITROGEN AND PHOSPHORUS ANNUAL MEAN CRITERIA Body Contact and Aquatic and Wildlife	Sufficient samples to determine at least two annual means and no exceedances	1 exceedance = the annual mean of at least three monthly means exceeds a criterion.
NITROGEN AND PHOSPHORUS 90th PERCENTILE CRITERIA Body Contact and Aquatic and Wildlife	Sufficient samples to determine at least two 90th Percentiles and no exceedances	1 exceedance = the 90th Percentile of at least 10 samples collected at least 10 days apart exceeds a criterion.
SUSPENDED SEDIMENT CONCENTRATION GEOMETRIC MEAN CRITERION Aquatic and Wildlife	Sufficient samples to determine at least two geometric means and no exceedances	1 exceedance = the geometric mean of at least four consecutive samples exceeds the criterion, excluding all samples collected during elevated flows,
TOTAL DISSOLVED SOLIDS FLOW-WEIGHTED ANNUAL MEAN CRITERIA On the Colorado River	Sufficient samples to determine at least two annual flow-weighted means and no exceedances	1 exceedance = the flow-weighted mean of all samples collected during a 12 month period exceeds a site-specific criterion.

EPA Listings – Surface waters listed as impaired by EPA are tracked on a separate 303(d) list. (See discussion in the following chapter.)

Assessing Whether Threatened

An assessment unit may be assessed as "threatened" when a trend analysis, based on credible and scientifically defensible data, indicates that the assessment unit is *likely* to be impaired before the next listing cycle. As clearly defined in the Code of Federal Regulations (40 CFR Chapter 1, §130.7.b.5.iv), an assessment unit assessed as threatened needs to be included in the list of impaired waters.

Methods for conducting such a trend analysis and criteria for determining whether a reach or lake is "threatened" have not been developed or defined in the Impaired Water Identification Rule. Therefore, assessment units were not assessed as threatened in the 2006 integrated assessment and listing report.

Trophic Status of Lakes

In the assessment report, ADEQ must also identify and classify public lakes according to trophic condition to fulfill requirements of section 314 of the Clean Water Act. Lakes can be classified in a continuum of lake trophic stages from low productivity to high productivity as nutrients accumulate or are depleted in the system, using the following terms:

- Oligotrophic – Clear lakes with low algal or plant productivity;
- Mesotrophic – Medium algal or plant productivity;
- Eutrophic – "Greener" lakes with high algal or plant productivity; and
- Hypereutrophic – Very high algal or plant productivity and light limited, as algae and macrophytes shade available light and inhibit further growth.

Trophic status is not used directly to assess designated use support. However, it may be used as further evidence of nutrient problems (weight-of-evidence), especially if a change in classification has occurred. For example, changes in status from mesotrophic to eutrophic might indicate that new sources of nutrients have been introduced into the lake system. Changing from hypereutrophic to eutrophic status could indicate successful implementation of nutrient source controls in the watershed.

Arizona's approach to deriving the Trophic State Index is based on Patrick Brezonik's *Trophic State Indices: Rationale for Multivariate Approaches* (1984). Derivation of TSI scoring and associated water quality values is documented in *Potential Nutrient-Related Targets for Lakes and Reservoirs in Arizona* (Malcolm Pirnie, 2005). The mean value of samples collected at a lake during the past 5 years is used to determine a lakes trophic status base on the following matrix:

Arizona's Trophic State Index (TSI)

TROPHIC STATE	TSI	CHLOROPHYLL *a* (*ug*/L) (maximum)	SECCHI DEPTH (meters) (minimum)	TOTAL PHOSPHORUS (mg/L) (maximum)	TOTATL KJELDAHL NITROGEN (mg/L) (maximum)
OLIGOTROPHIC	0	0.3	5.2	0.013	0.3
	10	0.6	4.0	0.019	0.3
	20	1.2	3.1	0.027	0.4
MESOTRPHIC	30	2.5	2.4	0.037	0.6
	40	5.0	1.8	0.052	0.7
EUTROPHIC	50	10	1.4	0.074	1.0
	60	20	1.1	0.103	1.2
	70	40	0.8	0.145	1.6
HYPEREUTROPHIC	80	81	0.6	0.203	2.1
	90	161	0.5	0.285	2.7
	100	323	0.4	0.400	3.5

Section 4
Final Listings

Assessment Categories

EPA created five categories for reporting assessments to provide a clearer summary of states' water quality status to Congress. New guidance gives the states an option of reporting an assessment unit in more than one category when TMDLs are completed. Note that EPA must approve of listings and changes to listings in Category 4A-C and 5 (the impaired water listings). (See subsection "Public Involvement and EPA Review.")

ADEQ added one category to institutionally track assessment units that are impaired due to natural conditions (4N). Because this list is not recognized by EPA, assessment units in 4N, also appear on one of the other 5 categories, depending on assessments of other designated uses.

Category 1: Attaining all designated uses.
Category 2: Attaining some designated uses, and no use is threatened or impaired.
Category 3: Insufficient or no data and information to determine if any designated use is attained.
Category 4: Impaired or threatened for one or more designated uses but a TMDL is not necessary because:
- 4A – A TMDL has already been completed;
- 4B – Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard;
- 4C – The impairment is caused by pollution but not a pollutant; or
- 4N – The impairment is *solely* by natural conditions (an Arizona list only).

Category 5: Impaired or threatened for one or more designated uses by a pollutant, and a TMDL needs to be developed or revised.

Category 1
Assessment units with sufficient data to determine that all designated uses are supported. In these assessment units, at least three samples were collected to represent seasonal differences for all core parameters.

Category 2
Assessment units with sufficient data to determine that one or more designated use is "attaining" and the remaining designated uses are assessed as "inconclusive." No use is threatened or impaired. The specific reasons a designated use is assessed as inconclusive can vary, but in general there are not enough samples to make a decision as to whether the use is "attaining" or "impaired."

Category 3
Assessment units with insufficient data to assess any designated use as "attaining" or "impaired." All designated uses are assessed as "inconclusive." The same reasons in Category 2 apply here: insufficient data. By default, this category also includes assessment units with no water quality data available. (Note: An inventory of these waters has not been completed because many ephemeral surface waters in Arizona have not been assigned a name or identification number.)

Category 4
Assessment units with at least one use assessed as "impaired" or "threatened" but development of a Total Maximum Daily Load (TMDL) analysis is not needed (at this time), for the following reasons:

- 4A – A TMDL has already been completed, is being implemented, and appears to be sufficient;
- 4B – Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard;
- 4C – The impairment is caused by pollution but not a pollutant; or
- 4N – Impairment is caused *solely* by natural conditions (no human contributions).

Category 4A – Assessment units where TMDLs have been completed and the pollutants covered under those TMDLs. The TMDL is an investigative study of pollutant sources that includes recommendations for pollutant reductions; however, even after recommended improvements have begun, it may take several years to see the effects. Therefore, the assessment unit remains impaired and listed in Category 4A until it is attaining standards again.

Category 4B – Assessment units where alternative pollution control requirements are being used to meet standards, rather than a TMDL. To be placed on 4B, ADEQ must submit to EPA for evaluation and review the following information:

- Statement of the problem causing the impairment, identifying pollutants and their sources;
- Description of the alternative pollution controls being implemented, including the funding mechanism for any associated costs and binding agreements to complete implementation;
- Reasonable time schedule for implementation of controls;
- Projection of when water quality standards will be met;
- Description of and schedule for monitoring, that will show progress with the control strategy; and
- Commitment to revise the control strategy if progress towards meeting water quality standards is not being shown.

Category 4C – Assessment units where the impairment is not caused by a pollutant, but instead by other types of pollution. For example, a designated use may be impaired solely due to lack of adequate flow or stream channelization. In such cases, the specific *cause and source* of the impairment has been carefully studied, generally through the TMDL process.

On the other hand, although low dissolved oxygen is not a pollutant, under EPA assessment guidance it is listed as the *cause of impairment* and a TMDL is required when the low dissolved oxygen is *caused by the presence of a pollutant* (e.g., nutrients or chemical oxygen demand). Similarly, low or high pH are listed as cause of impairment in Category 5, rather than 4C, when pollutants are thought to be causing or contributing to the impairment. To date ADEQ has not used Category 4C.

Category 4N – Assessment units where impairment is solely due to a natural conditions. These waters are protected under Tier 1 antidegradation rules (Arizona Administrative Code R18-11-107 and decisions concerning potential discharges or activities in the watershed that could increase the pollutant of concern must consider these waters to be "impaired" (e.g., grazing actions, construction permits). To be placed on this list, ADEQ must have evidence that anthropogenic activities are *not* contributing to the impairment. Waters are added to this list when:

- Sufficient monitoring data and exceedances have occurred that the assessment unit would otherwise be listed as impaired; or
- A TMDL investigation finds that the pollutant exceedances are *solely* due to natural causes or conditions and results in delisting the pollutant.

Category 5

Assessment units with at least one designated use impaired or threatened by a pollutant and a Total Maximum Daily Load analysis needs to be completed. The assessment unit remains on Category 5 until EPA has approved the TMDL or the pollutant is otherwise delisted.

The other uses may be any combination of attaining, inconclusive, and even impaired but not on the 303(d) List (see Category 4 above). For example, as TMDL's are completed those parameters are moved to Category 4A; however, additional parameters may be impairing the assessment unit. In such cases the surface water may appear both in Category 5 and in one or more of the Category 4s.

EPA has added several surface waters to the 303(d) List. Because these waters were listed based on criteria not available to ADEQ (e.g., fish consumption advisories, fewer exceedances or samples than required under Arizona's methods), these waters are kept on or removed from the impaired water list at EPA's discretion. (See further discussion in the Public Involvement and EPA Review section of this chapter.)

Multiple Category Listings

Assessment units in Categories 4 and 5 can be in multiple categories as the listings are base on the pollutant causing the impairment. For example, an assessment unit could be impaired by arsenic, copper, selenium, suspended sediment and low dissolved oxygen. Because TMDLs have been completed for arsenic and copper, the assessment unit appears in Category 4A. The stream now appears to be impaired based on the newly adopted suspended sediment criteria standard, so the assessment unit also appears in Category 5. New monitoring and laboratory methods allow us to detect much lower concentrations of mercury, so new assessments show that the reach is impaired by mercury. However, the main source of the mercury has developed a plan under its permit obligations to remediate a waste site which should mitigate the mercury contamination. A TMDL for mercury is unnecessary at this time, and the remediation plan allows the assessment unit to be listed in Category 4B for mercury.

Such multiple listings provide credit for taking actions to completing TMDLs and initiate remediation activities, even though other water quality issues have now been shown to exist.

Water Quality Improvements and Delisting Waters

Delists

When a pollutant is removed from Category 5, the pollutant must be officially "delisted" from the federal 303(d) List. A list of assessment units and pollutants being delisted are included in an appendix of the assessment report. Removal is generally due to the following:

- Water quality improvements,
- Changes in standards, designated uses, or assessment criteria,
- New data shows that the surface water is not impaired
- New data shows that impairment is solely due to natural conditions (remains impaired), or
- The TMDL has been completed (remains impaired).

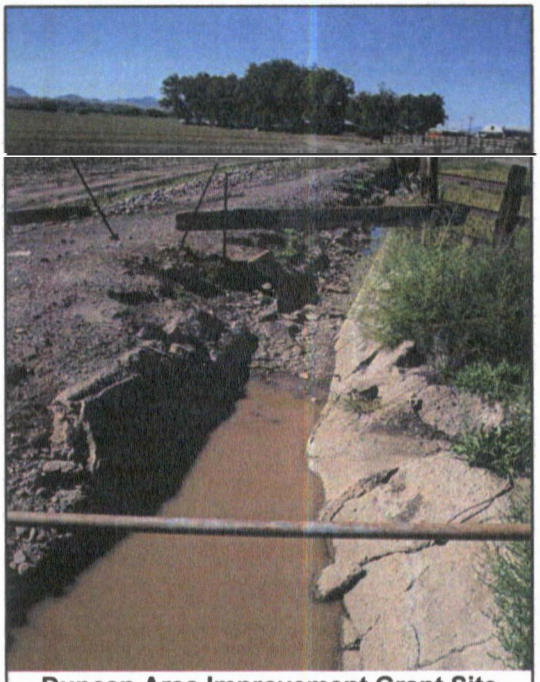
Although delisted from the 303(d) List, the surface water may remain "impaired." The surface water is simply moving from Category 5 to Category 4.

Actions Resulting in Water Quality Improvements

When water quality improvements results in an assessment unit being "no longer impaired" by a pollutant, and such improvements can be directly attributed to actions taken within the watershed, Arizona has a real success story!! ADEQ has started to track these in an appendix to the assessment report.

Such improvements are generally *dependent* on continuing the water quality improvement action and not allowing new discharges of the pollutant. Decision makers concerned with potential discharges or new activities in the watershed (e.g., grazing actions, permits) need to be aware of the management practice (BMP), treatment, or other action, along with any TMDL loading requirements.

This list is different than the "Delist" table because it includes only surface waters delisted due to water quality improvements and it accrues pollutants from one assessment to the next.



Duncan Area Improvement Grant Site

Public Involvement and EPA Review

Public participation and public review are important aspects of developing the integrated assessment and listing report. The public is encouraged to be involved in the process at several stages.

Assessment Methods Development

Public participation is invited and encouraged during the development and revision of Arizona's Impaired Water Identification Rule **(Appendix C)**. Informal public meetings are augmented by information available on ADEQ's website to provide all interested stakeholders many opportunities to discuss assessment issues and potential revisions. Rules are modified only after a formal public review and comment process is complete.

A draft of this Assessment Methods and Technical Support Document is provided for public review and comment during the initial review period for the integrated assessment report. Interested stakeholders are encouraged to comment about both impairment criteria and attainment criteria used during the assessment. Methods will be modified as needed before the final assessment is completed and submitted to EPA.
EPA is included as a stakeholder and provides comments on both the Impaired Water Identification Rule and this Assessment Methods document. Although EPA does not have to approve of ADEQ's assessment and listing methods, it considers the methods when reviewing Arizona's impaired waters lists. Any deficiency in these methods can be cited as a factor in an EPA decision to disapprove of a part of Arizona's 303(d) List.

Surface Water Quality Standards

The public is also encouraged to participate in developing surface water quality standards. Formal meetings and informal focus sessions are scheduled throughout the Triennial Review process. For those who are unable to attend meetings, ADEQ's website provides information about proposed changes.

EPA must grant final approval of any changes to these standards before they are adopted. EPA also encourages public comments and further input by federal resource agencies before giving approval for proposed revisions.

Integrated Assessment Report and Impaired Waters List

Monitoring data and other water quality data are requested from state, federal, and local agencies and other potential monitoring entities who collect, receive, or manage water quality data or information (e.g., NPDES/AZPDES permit holders, WQARF projects, volunteer monitoring groups.) ADEQ works with monitoring entities to develop monitoring plans so that data fulfills credible data requirements, and so the data can be uploaded into its water quality database.

A 30-day period initiates the public review of the draft integrated assessment and listing report. Notices are placed in major newspapers throughout Arizona and past reviewers are given written notice that the report can be downloaded from ADEQ's web site at: www.azdeq.gov/environ/water/assessment/assess. Comments from this public review are considered in making the listing decisions. A written response to these comments is provided in the publication of the draft list in the Arizona Administrative Register.

A second and formal 45-day public review period is also provided for the draft 303(d) List of impaired waters (those waters requiring a TMDL). The list and a responsiveness summary from the informal review are published in the Arizona Administrative Register (A.A.R). The listing of an assessment unit or pollutant can be appealed pursuant to Title 41, Chapter 6, Article 10 by anyone who submitted comments on the draft list. If a notice of appeal is filed, the listing involved is not included in ADEQ's submission to EPA until the listing is upheld by ADEQ's Director or the appeal is withdrawn. A second responsiveness summary is provided with the Department's final submission to EPA.

EPA Approval

After ADEQ's public process and revisions are complete, ADEQ submits the integrated assessment and listing report to EPA Region IX. To be considered complete, the submittal package must include:

- A cover letter;
- A hard copy of the integrated assessment report and listing report;

- An electronic version of the assessment (preferably using EPA's Assessment Database) and GIS covers linked to the surface water assessments;
- A list of impaired waters and pollutants of concern, separated into Categories 4 and 5.
- A prioritization of all TMDLs that must be developed, stating the year when the TMDL will be initiated and completed;
- A list of waters and pollutants to be removed from the 303(d) List, including those that remain impaired and are moving from Category 5 to 4,
- A list of waters and pollutants that are no longer impaired (moving from Category 4 or 5 to another category);
- Proposed future water quality monitoring;
- Copies of comments received on the draft and the Department's responses to those comments;
- Documentation and technical support of assessment methods;
- Documentation of the public process used; and
- Documentation of data used to support assessments.

EPA also requests other water quality related information or data that was not used for assessments, such as fish tissue data, contaminated sediment data, reports of fish kills, swimming area closures, biocriteria and habitat data. They may use this additional data to support other listing decisions.

Partial Approval and "Over-filing" – The 303(d) List of impaired waters needing TMDLs (but not the assessment report) is either approved, disapproved, or partially approved/disapproved by EPA within 30 days.
If a portion of the list is partially approved or disapproved, EPA proposes changes to the list and initiates another public review and comment period. Proposed revisions to Arizona's 303(d) List are published in the Federal Register. EPA works with ADEQ to attempt to notify all interested parties of this publication. At the end of the comment period, EPA evaluates public comments and compiles the final approved 303(d) List.

In the past, EPA has identified assessment units and pollutants of concern that needed to be added to Arizona's impaired water list to make the list consistent with federal regulations (over-filings). Because the original listings were not made according to Arizona's Impaired Water Identification Rule, they cannot be removed from the list based on Arizona's rule. In subsequent assessments, EPA must decide when these additional impairments are removed from Arizona's 303(d) List. In this respect, these impairments are tracked separately. However, once listed by EPA, ADEQ recognizes these waters as impaired, initiates TMDL according to priorities, and protect them from further pollutant loadings according to Arizona's Antidegradation Rules and permit requirements.

The list submitted to for public review and EPA's approval includes surface waters listed by EPA. This final draft list indicates the priority for completing the TMDL based on the prior assessment. (In the 2006 draft, 28 surface waters had one or more impairment listing by EPA). After actions are taken by EPA, the *final* integrated water quality assessment and listing report is posted on ADEQ's web site. A final electron assessment is submitted to EPA is also submitted to EPA. This final list includes surface EPA's revisions.

Coordinating with Neighboring Jurisdictions

EPA advises states to coordinate with neighboring jurisdictions to ensure that assessments of surface waters which cross jurisdictional boundaries are reasonably consistent between states, taking into account differences in data availability and applicable standards.

Arizona works with neighboring jurisdictions during several stages of the assessment process, including standards development and assessment methods development. The five states surrounding Arizona and the 21 Tribal nations within Arizona are routinely included in our public review notification. Comments received are evaluated and additional discussion may be initiated. If a conflict cannot be resolved between ADEQ and the other jurisdiction, EPA will be notified.

Arizona has an excellent Border Program that works with Mexico. However, resolution of impaired waters has been a very complex matter, involving high-level actions, and requiring coordination with State Departments of both nations.

Prioritizing and Scheduling TMDLs

Prioritizing the 303(d) List

Prioritization criteria for scheduling TMDL development are established in the Impaired Water Identification Rule (A.A.C. R18-11-606) **(Appendix C)**. In general, if a substantial threat to health and safety of humans, aquatic life, or wildlife is noted, the surface water is listed as *high priority* and ADEQ initiates development of the associated TMDL within two years following EPA's approval of the 303(d) List).

High priority factors:

- Substantial threat to health and safety of humans, aquatic life, or wildlife based on toxicity of the pollutant and magnitude or duration of the exceedance;
- The presence of a Threatened or Endangered species (T&E species) that may be further jeopardized by the water quality pollutant. This is determined by looking at critical habitat, published reasons for decline and vulnerability of the species, and discussions with the Arizona Game and Fish Department and the U.S. Fish and Wildlife Service;
- Special protection of the water resources, such as classification as a "unique water," "wilderness area," "wild and scenic river," or other state or federal designation;
- Delay in the TMDL could jeopardize a timely permit action or the Department's ability to gather sufficient credible data to support the TMDL;
- Public interest and support for development of the TMDL;
- The assessment unit has an important recreational and economic significance; or
- The pollutant has been listed for eight or more years.

Medium and low priority ranking factors are also identified in the Impaired Water Identification Rule. The rule provides that several low priority factors can take precedence over high priority factors because completing a TMDL at this time would either be inappropriate, premature, or an inefficient use of resources. The low priority factors that trump high priority factors include:

- ADEQ has formally submitted to EPA a proposal to delist the surface water or pollutant based on new data, new standards, or new designated uses.
- Flow conditions inhibit collecting samples during critical conditions or a variety of conditions necessary for modeling;
- The uncertainty of timely coordination with Mexico, another state, or a tribal reservation needed to conduct the TMDL or implement necessary watershed improvements;
- The assessment unit is expected to attain water quality standards due to:
    - Changes in treatment or best management practices;
    - Discharges or activities related to impairment have stopped; or
    - Other controls are in place or scheduled;
- Naturally occurring conditions are the major contributor to the impairment.

It may become necessary to shift priority ranking of an assessment unit due to significant changes in resources to complete TMDLs or as new information is obtained concerning one of the priority factors. Such changes are negotiated with EPA and are made known to the public through the TMDL status page on ADEQ's web site.

Monitoring Priorities – The Planning List

Monitoring needs are identified during the assessment process. In general, the needs fall into one of the following:

- Insufficient data (e.g., criteria is exceeded, missing core parameters or lack of seasonal coverage);
- Support for TMDL development; or
- Determine effectiveness of strategies implemented to reduce contaminant loading.

How does ADEQ prioritize this monitoring? High priority factors include:

- Substantial threat to health and safety of humans, aquatic life, or wildlife based on toxicity of the pollutant and magnitude or duration of the exceedance;
- High number of exceedances compared to the number of samples taken;
- Probable evidence of narrative standards violations;
- The presence of a Threatened or Endangered species (T&E species) that may be further jeopardized by the water quality pollutant;
- Special protection of the water resources;
- Time constraints for a permit action;
- Public interest and support for development of TMDL development; and
- Need to initiate effectiveness monitoring.

Other factors to consider in scheduling monitoring include:

- Potential for having sufficient current data to support an assessment (considering the age and amount of data previously collected);
- Representation of critical conditions (i.e., season, precipitation, activity in the watershed when exceedances have occurred in the past); and
- Scheduling of rotational ambient watershed monitoring

In Arizona's 2006 integrated report, a "data gaps and monitoring needs" table is included in each assessment unit report. The Department uses this information as a "planning list" to schedule and prioritize monitoring within the ten watersheds according to the following criteria:

Low
- Missing core parameters or seasonal distribution; or
- Adequate baseline data and actions in the watershed should result in improved water quality.

Medium
- Some exceedances, but low magnitude compared to standard;
- Some exceedances, but low frequency of exceedances (not enough to be assessed as impaired); or
- Need to determine effectiveness monitoring.

High
- High magnitude exceedances when compared to standard; or
- Need to support a scheduled TMDL.

Assessment units with "high" priority monitoring needs would be scheduled for monitoring in the two years or as needed to support a TMDL. Medium or low priority waters would be addressed as part of the five-year watershed cycle, with the goal of collecting sufficient monitoring data to assess the majority of the waters on the Planning List within five years. It should be noted that current drought conditions and past budget deficits have had an impact on ADEQ's ability to obtain sufficient data during critical conditions on some waters on the Planning List.

SECTION 5
FURTHER TECHNICAL RATIONALES

Binomial Distribution Method

Impairment Based on the Binomial

How many exceedances must occur before one determines the assessment unit is impaired? EPA has provided specific guidance for working with acute and chronic aquatic and wildlife standards (two or more exceedance in a 3-year period is impaired). What about other parameters?

EPA's CALM document (2002) suggests that an exceedance rate greater than 10 percent for conventional parameters, such as dissolved oxygen and pH, indicates impairment of a designated use. The Department has extended this approach to Arizona's human health standards that were established to protect for 70-year lifetime exposure periods, since an exceedance rate under 10 percent should not negatively impact human health (with the exception of *E. coli* bacteria and nitrate which are pollutants that can be acutely toxic to humans).

The purpose of the binomial distribution method is to balance the two types of error possible in assessment and listing decisions:

Type I error – Listing an assessment unit that is *not* impaired (a false positive), and
Type II error – *Not* listing an assessment unit that *is impaired* (a false negative)

To reduce listing error, the Department adopted a statistical approach to 303(d) listing, using a binomial distribution method and establishing a statistical "confidence level" for assessments. This method is a statistical tool used to test a hypothesis. Using the 10 percent rule from CALM guidance, the null and alternative hypotheses, respectively, become:

H_o: The true exceedance rate (p) is ≤10%; the surface water is not impaired;
H_a: The true exceedance rate (p) is >10%; the surface water is impaired.

The binomial establishes a minimum number of exceedances, and a minimum number of total samples, based on >10% exceedance rate at a 90% confidence level as acceptable for assessments. The minimum number of exceedances reduces Type I error – *listing* an assessment unit that is *not impaired*. Here, Type I error is reduced by establishing a high level of statistical confidence to avoid an unnecessary listing. The minimum number of total samples reduces Type II error – *failing to list* an assessment unit that *is impaired*. Type II error is reduced by increasing the sample size so that exceedances are not missed. Establishment of a statistical confidence level reduces both Type 1 and Type II errors.

As shown in the table below, the number of exceedances needed is different based on the raw score or binomial approach. In the raw score approach exceedances are counted (yes or no exceeded) and a percent exceedance calculated. While the binomial testing approach looks at the *probability* of exceedance at a chosen confidence level.

Comparison of Assessment Methods

ASSESSMENT METHOD	NUMBER OF EXCEEDANCES IN 10 SAMPLES TO GET > 10% EXCEEDANCE RATE
Raw Score	2 of 10 samples
Binomial at 90% Confidence Level	3 of 10 samples

Statistically, the unknown distribution of a pollutant measurement can be transformed to a binomial distribution based on the sample size (n), the measured number of exceedances (x), and the true exceedance probability (p). The BINOMDIST function in Excel (or other spreadsheets) can then calculate the probability that the exceedance rate is greater than 10 percent, and therefore, the probability that the surface water is impaired, for a known number of samples (n) and known number of exceedances (x).

Using another statistical function (CRITBINOM in Excel), a given number of samples and a given confidence level, can be entered, and the minimum number of exceedances needed to determine impairment is calculated. This function was used to create the binomial listing table in the Impaired Water Identification Rule R18-11-605 (**Appendix C**). For example, "*=CRITBINOM(10, 0.105, 0.90)*" is entered into an Excel spreadsheet to determine the minimum numbers of exceedances necessary to determine impairment, based on 10 samples, at 10.5% or higher exceedance rate, and a confidence level of at least 90 percent. (Notice that 10.5% is used in the calculation to numerically represent >10%.)

The Tiered Approach – When ADEQ initiated the binomial approach the Department created a two-tiered approach for determining impaired waters in an effort to balance the two types of errors. Waters with exceedances of water quality standards could be placed in one of two tiers. The tiers are differentiated by confidence level, minimum sample sizes, and different cutoff values as shown in the table below.

Two Tiered Approach

LIST	CONFIDENCE LEVEL	MINUMUM NUMBER OF SAMPLES TO LIST	MINIMUM NUMBER OF EXCEEDANCES TO LIST
Tier 1 - The Planning List	80% confidence of 10% exceedance rate	10 samples	3 exceedances
Tier 2 - The Impaired Water List	90% confidence of 10% exceedance rate	20 samples	5 exceedances

As noted above, the Department may place surface waters on either list without the requisite number of samples or exceedances for specific pollutants such as toxics or bacteria, which pose a substantial threat to aquatic life, wildlife, of human health. This occurs with pollutants not assessed using the binomial approach. It should be noted that ADEQ may also place waters on its internal Planning List due to lack of sufficient data to make an assessment.

Subsections 605(C) and 605(D) of the Impaired Water Identification Rule (**Appendix C**), deal with use of the binomial distribution tables for placing an assessment unit on either the Planning List or the 303(d) List, based on a minimum number of samples and a minimum number of samples exceeding standards. Methods are also provided for using larger datasets then shown in the binomial tables.

Delisting Based on the Binomial

As described in Section 4, assessment units are no longer impaired if there are sufficient data to show that the assessment unit is neither impaired, nor belongs on the planning list. This would require a minimum of 10 samples with no more than two samples exceeding the applicable standard. However, at least some of the samples must have been collected during "critical conditions" and at "critical locations," which are under conditions and at locations where exceedances have occurred in the past, if those conditions still exist.

Proposed Revisions of the Binomial

Further statistical research on the binomial has shown that the minimum of 20 samples and minimum of 5 exceedances cannot be statistically supported. Also, a higher confidence level (95% Confidence) can reasonably be achieved.

As shown in the following table, three of nine samples would exceed standards in 99 of 100 9-sample trials (99.01% of the time), if the exceedance rate was 10.5% or greater. Actually, as the number of samples decreases, the confidence level increases when there are three exceedances with fewer than 10 samples. Therefore, the Department can have a very high confidence in "impairment" when three exceedances occur out of nine samples.

Probability of Impairment
Based on Three Exceedances and Fewer than 10 Samples

Number of Exceedances	Number of Samples	Probability of Impairment*
3	3	100.00%
3	4	99.99%
3	5	99.94%
3	6	99.85%
3	7	99.67%
3	8	99.40%
3	9	99.01%

*Using BINOMDIST function in Excel to calculate the level of confidence that the exceedance rate is at or above 10.5% (greater than 10%).

For assessments this means that if at least three exceedances have occurred with less than 10 samples, the need to increase sample size (by further monitoring to 10 or even 20 samples) becomes unnecessary, as impairment has been established. Actually, a Type II error *will* occur if the listing is delayed.

Since the 2002 assessment, EPA has taken issue with use of a minimum of five exceedances with a minimum of twenty samples. In 2002 and 2004, EPA partially disapproved Arizona's 303(d) List and listed any waters with as few as three exceedances. In the 2004 assessment, this issue resulted in 10 pollutant listings being added by EPA. To make such over-filing less confusing to the public, ADEQ provides comments within the integrated assessment and listing report on those assessment units where EPA over-filing is expected.

According to 2002 federal CALM guidance, "Smaller sample sizes are prone to yield erroneous *attainment* (not impairment) decisions because they have a *low* probability for detecting exceedances." This, in fact, lends further support for making a listing with fewer than 10 samples. Because small sample sizes are less likely to detect exceedances, if exceedances *do* occur, the confidence in impairment is even greater than in a larger sample size with sporadic exceedances (illustrated by the difference in confidence between three of three exceedances and three of nine exceedances in the table above).

Draft revisions to the Impaired Water Identification Rule have been proposed due to these shortcomings in the binomial method and to better match federal listing criteria; however, these revisions have not yet been promulgated through the required public process and thus ***were not used in this assessment***.

Other Assessment Methods

A review of the 2004 listings reveals that although the binomial is an important assessment approach, most 303(d) listings are based on other methods, as shown in the table below.

2004 303(d) Listings

Assessment Method	Listings	Parameters
Binomial	23 (10 added by EPA in 2004)	Boron, dissolved oxygen, pH, and nutrients
Acute Aquatic and Wildlife Criteria	18	Metals (cadmium, copper, chromium, silver, zinc)
Chronic Aquatic and Wildlife Criteria	21 (3 mercury listings added by EPA in 2004)	Ammonia (4), copper (2) mercury (3) selenium (12)
Other Acute Toxicity	9	*E. coli* bacteria (8), nitrate (1)
Statistics	4	Suspended sediment concentration
Narratives	51 (All 51 added by EPA, 9 added in 2004)	Mercury in fish tissue (9), pesticides in fish tissue (Middle Gila only) (39), sediment/bottom deposits (3)

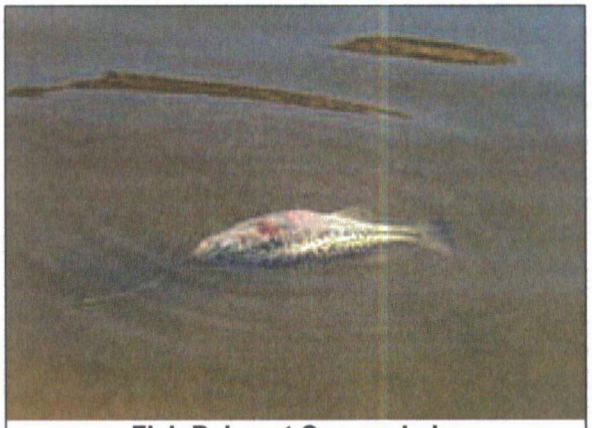
As discussed previously, Arizona's TMDL statute (Appendix B) requires development of narrative implementation procedures before ADEQ can apply narrative standards to 303(d) listing decisions. EPA does not share that restriction and

has listed many assessment units due to violations of narrative standards, primarily based on fish consumption advisories (see table above). In 2004, EPA also listed three assessment units due to excess sediment or bottom deposits.

The other assessment methods were discussed in Section 3 of this document, but what is the scientific and statistical basis for these approaches?

Assessments Based on Aquatic and Wildlife Acute Criteria

Arizona's toxic pollutant criteria established to protect the Aquatic and Wildlife designated use require a very different assessment and listing method from the binomial described in the preceding section. The binomial is applied primarily to human health standards, which were developed to protect for lifetime exposure periods, and therefore allows a given percentage of exceedances to occur (10%). Toxic pollutant criteria for the Aquatic and Wildlife use, however, were developed to protect for far shorter periods of exposure, due to the shorter lifespan of the aquatic life and wildlife they protect. Studies show that test organisms can tolerate *no more than one* exceedance of either the acute or chronic aquatic and wildlife criteria over a three-year period. In fact, studies show that even *one* exceedance can cause damage if the magnitude of exceedance was very high or the affected area was very large (EPA, 1991). Clearly, a statistical approach based on a percentage of exceedances, such as the binomial, is not valid for these standards and would not protect the designated use.



Fish Dying at Canyon Lake

Acute criteria protect against short-term effects of high level pollutant concentrations, which include lethality and immobilization. Acute criteria protect for one-hour exposure periods. Aquatic life may recover from one exceedance of criteria per three-year period; however, recovery is not likely if even minor exceedances occur more often. A statistical approach, such as the binomial, is not appropriate for this type of standard. Instead, listings must be made based on two or more exceedances in a three-year period, regardless of whether the sample size is small or large.

The Department requires that surface waters be placed on the 303(d) List based on two or more exceedances of these criteria. This listing method must be applied regardless of total sample size. Note that although listing based on one large exceedance could potentially be justified, it is the Department's policy, and standard practice throughout the country, that listings will be made only if evidence is available to show that the impairment is persistent or recurring. Therefore, two or more exceedances are needed to make a 303(d) listing. This requirement is also consistent with EPA assessment guidance recommendations: *CALM* (2002), *Guidance for 2004 Assessment, Listing and Reporting* (2003), and the *Technical Support Document for Water Quality-based Toxics Control* (1991).

The Department does have some flexibility to delay a listing under the weight-of-evidence approach while collecting additional monitoring data when data reliability may be a concern. An example might be samples with exceedances near the laboratory reporting limit and sources of the pollutant were either unknown or unlikely in the watershed.

As required in the TMDL Statute §49-232(C)(4) (**Appendix B**), the criteria for establishing that an assessment unit is no longer impaired cannot be any more stringent than the criteria for adding an assessment unit to the impaired water list. In this case, delisting would require no exceedances during the last three years of monitoring. At least some of the samples must have been collected during "critical conditions" and at "critical locations," which are under conditions and at locations where exceedances have occurred in the past, if those conditions still exist.

Assessments Based on Chronic Aquatic and Wildlife Criteria

"Chronic" conditions for aquatic life are determined by as short as a four-day exposure, as compared to a one-hour exposure for acute criteria. The four-day period was selected by EPA to develop chronic criteria because it was the shortest duration over which chronic effects are sometimes observed. Longer exposures would be even more likely to cause chronic impacts. Chronic exposures can be lethal to aquatic organisms, although the effects are not usually immediate upon exposure. Chronic impacts include disease, behavioral abnormalities, inability to reproduce, reduced growth and survival, physical abnormalities, genetic mutations, and eventual death.

EPA's *Technical Support Document* (1991) and current assessment guidance documents all indicate that an aquatic community should be able to recover from one chronic exposure every three years, unless there is a long exposure duration. Therefore, ADEQ's assessment method determines impairment at two or more exceedances during the assessment period.

The challenge in establishing assessment methods for these criteria lies in demonstrating that a chronic exposure has occurred. If at least four days of data are available within a seven-day period, the Department uses the central tendency of the dataset to determine whether an exceedance has occurred. For standards that that vary based on water hardness, ADEQ determines an exceedance based on 50% or more samples within a week exceeding standards. For non-hardness dependent standards, in most cases an average is determined, as suggested by EPA guidance. But this type of data is seldom available, and where available, only represents those dates sampled. Can the instantaneous grab samples typically collected be used to represent a 4-day period?

EPA's *Guidance for 2006 Assessment, Listing, and Reporting Requirements Pursuant to Sections 303(d), 305(b), and 314 of the Clean Water Act* states that for criteria with multiple day averaging periods (such as chronic criteria), states should develop decision rules for concluding impairment where information indicates a ***reasonable likelihood*** that the average was exceeded. For example, if conditions have remained fairly stable over the period of interest (four days), it would be valid to use a grab sample to represent that time period.

The Department has developed a method for determining chronic criteria exceedances based on grab samples, for use on dates when four days of data are not available. This method assumes that stable conditions were occurring at the time unless there is information to the contrary. If sufficient chronic Aquatic and Wildlife criteria have been exceeded to result in the assessment unit being listed as impaired, ADEQ looks at the following information to determine whether 4-day stable conditions were occurring when exceedances occurred:

- Point source discharge records in the reach or immediately upstream;
- Field notes and weather records concerning precipitation and runoff;
- Gaging station records, when available;
- Land uses in the vicinity;
- Records of chemical spills or other unusual events; and
- Historic patterns of pollutant concentrations, when available

If readily available contextual information indicates that the pollutant and stream flow ***likely*** remained fairly constant over that four day period, the Department will conclude that the grab sample result is valid for chronic Aquatic and Wildlife criteria.

Exceedances of chronic criteria will not be used for listing decisions when unstable conditions were likely, especially in watersheds with precipitation-dependent sources of pollutants (e.g., mine tailings piles). Examples of evidence of unstable conditions include, but are not limited to, samples being collected during:

- A precipitation event with runoff lasting shorter than 4-days;
- The first flush of a precipitation event; or
- A short-lived but high flow monsoon.

However, if the data were collected after several days of high flow, the sample would be assumed representative of the 4-day average conditions.

If the exceedance occurred at or near a flow gaging station, the stream is considered stable if the coefficient of variation in flow records for the 4-day period when the sample was collected is at or below 0.2. If above 0.2, chronic criteria cannot be applied to the pollutant data. The coefficient of variation is determined by dividing the standard deviation of the values by the mean of the values, and provides a way of evaluating the size of the standard deviation of the dataset relative to that of the mean. This is a statistical way to evaluate variability in datasets that have very different means. "0.2" is a common threshold number used, below which data is considered to have very minimal variability.

See examples below, where the sample date is highlighted in purple. In both cases, the flow was 224 cfs when the sample was collected. In the first example, the coefficient of variation is below 0.2, so flow would be assumed to be stable. In the

second sample, the coefficient of variation is above 0.2, so flow would be unstable, and the chronic criteria would not be used.

Example of Stable Flow Determination

DATE	DISCHARGE (cfs)	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION (standard deviation ÷ mean)
02/06/2003	230	229.3	3.4	0.015
02/07/2003	227			
02/08/2003	234			
02/09/2003	224			
02/10/2003	231			
02/11/2003	230			

Example of Unstable Flow Determination

DATE	DISCHARGE (cfs)	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION (standard deviation ÷ mean)
02/06/2003	176	211.2	46.3	0.22
02/07/2003	180			
02/08/2003	296			
02/09/2003	224			
02/10/2003	206			
02/11/2003	180			

In a lake, stable conditions will assume to be occurring unless lake "turnover" or other disturbances are documented when the sample was collected. Lake temperature profiles and other field information will be used to look for such disturbances.

The need to show stable conditions is less of an issue with a parameter, such as selenium, that exceeds chronic criteria primarily during low flow conditions in Arizona. (As shown in the previous table, 12 of the 21 chronic criteria listings in 2004 were due to selenium.) For example, even if the selenium sample was collected during a storm event, it is reasonable to assume that the result represented a diluted concentration and that the daily average concentration was normally much higher. As EPA's guidance indicates (2005, page 34), in such cases exceedances are a fairly reliable indicator that the average concentration in the assessment unit is above the water quality standard, despite not being representative of the average concentration.

In a lake or stream, if one or more point source discharges provide a *significant* contribution to the receiving water, the facility discharge records are reviewed to determine whether flow and associated pollutant discharges were relatively consistent during the four-day period when the exceedance occurred. Other evidence concerning unstable flow or pollutant discharges can be provided by the facility.

The criteria for establishing that an assessment unit is no longer impaired is the same as for acute Aquatic and Wildlife criteria – no exceedances during the last three years of monitoring, and at least some of the samples must have been collected during "critical conditions" and at "critical locations."

Assessments Based on Nitrate and *E. coli* Criteria

Nitrate (or nitrate/nitrite) and *E. coli* bacteria are two pollutants that may be acutely toxic to humans at levels found in Arizona. Therefore, the Impaired Water Identification Rule established the same assessment criteria as used for acute Aquatic and Wildlife criteria – impaired if two or more exceedances of the single sample maximum criteria occur during a three-year period.

In most cases a listing is made as soon as two exceedances occur, unless the weight of evidence indicates the listing would be in error. Three issues with *E. coli* bacteria data are being addressed through the weight-of-evidence approach until the Impaired Water Identification Rule can be revised:


Slide Rock State Park

- The reliability of "most probable numbers" – Both lab and field bacterial analyses provide an estimation of bacterial density, reported in terms of a Most Probable Number (MPN). For example, using the multiple tube technique, if the result is reported as 240 colony forming units (CFU), there is a 95% confidence level that the result is between 100 and 940 CFU (*Standard Methods for Examination of Water and Wastewater, 20th Edition*). Only two exceedances will result in a listing; therefore, 303(d) listing decisions are not based on results reported relatively near the single sample maximum standards of 235 CFU (for Full Body Contact) or 576 CFU (for Partial Body Contact). Instead, screening values of 300 and 630 CFU, respectively, are used for impairment decisions, so that minimum exceedances must be above these screening values. To be clear, all results above the standard are reported as exceedances in the assessment report; however, a comment is made when the result is below the screening value.

- Bacterial contamination in flood flows – Flood flows are normally heavily contaminated with bacteria. This contamination is due to both natural and anthropogenic sources, so the exceedances cannot be exempted. However, completing TMDLs due to such contamination would be a waste of ADEQ's limited resources. Therefore, exceedances occurring during flood flows will not be used as the minimum exceedances for an impairment decision. In such cases, impairment decisions will be delayed until at least two exceedances have occurred during non-flood events. This does not mean that all samples collected during elevated flows will be excluded.

- Bacterial exceedances sites on very large reservoirs – Exceedances occurring at separate beaches in a large river reservoir, provide a different level of risk to human health than exceedances occurring at the same beach or in the same stretch of river. Bacterial exceedances are counted and assessed per monitoring site at large reservoirs where sites are located several miles apart.

The criteria for establishing that an assessment unit is no longer impaired is the same as for acute Aquatic and Wildlife criteria – no exceedances during the last three years of monitoring, and at least some of the samples must have been collected during "critical conditions" and at "critical locations."

Assessments Based on Statistically Derived Standards

When *two or more* exceedances of a statistically-derived standard occur, the surface water is assessed as impaired. These standards, as established in Arizona's Surface Water Quality Standards (**Appendix A**), establish both a minimum sample size and a statistical calculation. The statistically-derived standards include:

- *E. coli* geometric mean;
- Suspended sediment concentration (SSC) geometric mean;
- Nutrient ninetieth percentile;
- Nutrient annual mean; and
- Total dissolved solids (TDS) flow-weighted annual mean in the Colorado River.

The *Escherichia coli* bacteria geometric mean standard was applied only to locations with a minimum of 4 samples in a 30-day period (Slide Rock State Park on Oak Creek and Lake Havasu beaches). Although the surface water standards revised in 2002 allow a geometric mean of the last four samples taken (samples can be a year apart or more), the current Impaired Water Identification Rule specifically states that *a 30-day bacteria geometric mean standard* would be used. Until the Impaired Water Identification Rule is revised through a public rule making process, it must be implemented as written. (Note: Single sample maximum criteria are also applied to *E. coli* – see discussion above.)

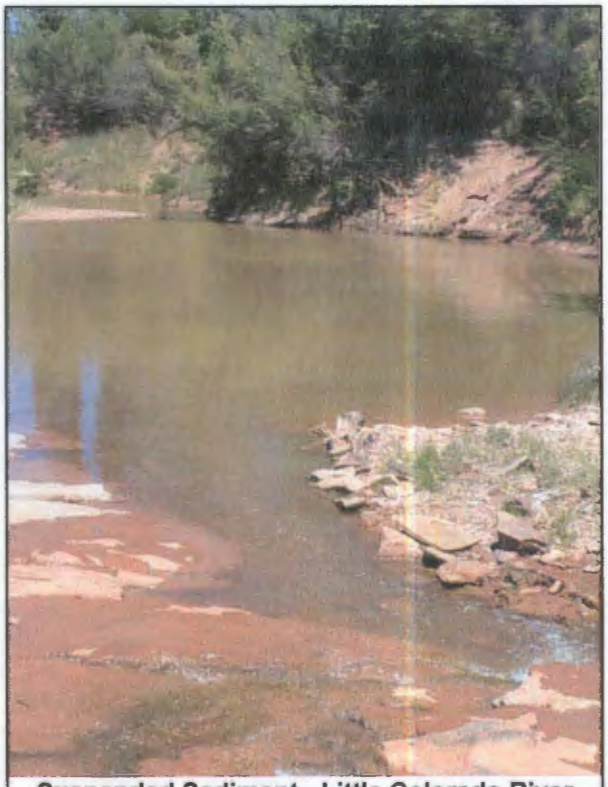
Applying the Suspended Sediment Concentration standard to assessment is complex, so is discussed in detail below.

To determine that an assessment unit is no longer impaired, the minimum data requirements are simply the number of samples necessary to re-calculate the statistical value for comparison to the standard. The assessment unit will be delisted if the standard is not exceeded, and at least some of the samples were collected during "critical conditions" and at "critical locations."

Using the Suspended Sediment Concentration Standard

In 2002, the Department adopted a suspended sediment concentration (SSC) standard to protect Aquatic and Wildlife designated uses and concurrently repealed turbidity standards. The SSC standard of 80 mg/L is expressed as a geometric mean of a minimum of four (4) samples and applies only to streams with the Aquatic and Wildlife warmwater or coldwater designated use, and not to lakes or to ephemeral or effluent-dependent streams.

Since some degree of suspended sediment is natural in streams of the arid west, especially during storm flows, this new standard excludes these precipitation events where large loads of sediment may be naturally flushed downstream. The SSC standard can be applied and assessed only at or near base flow, which is sustained largely by ground water. The standard is intended to protect fish from chronic, long-term effects of excess suspended sediment.



Suspended Sediment - Little Colorado River

For assessment purposes, two issues arise: How to determine whether sample was collected during normal flow? How to determine if two or more exceedances of the geometric mean occurred during the assessment period? These issues are resolved in a three-step assessment process:

Step 1 – Before a geometric mean is applied, base flow must first be determined. Determination of base flow is possible only where historical flow records are available, such as at USGS gaging stations. Flow data from the last ten to thirty years, depending on availability, are assembled and the 50th percentile of flow is determined.

Step 2 – Suspended sediment concentration data within the assessment period are then compiled, along with the corresponding instantaneous flow measurements. Any SSC samples collected during flows greater than the 50th percentile of flow are not used in the geometric mean calculation.

Step 3 – To determine if more than one exceedance occurred, a rolling geometric mean is calculated, using each four consecutive SSC values not excluded due to high flow.

For example, at Duncan, Arizona, on the Gila River, the U.S. Geological Survey gage indicates that the 50th Percentile of flow is 78 cfs. The following tables show how this information would be used to determine exceedances of the SSC geometric mean standard.

Example SSC Data Analysis
Original Data

Date	SSC (mg/L)	Flow (cfs)
10/30/2002	27	29
12/09/2002	67	70
02/04/2003	25	68
05/13/2003	<5	67
09/15/2003	32	23
11/03/2003	92	15
02/09/2004	*123*	*92*
07/27/2004	4560	70
10/27/2004	9499	67
03/01/2005	*630*	*2000*
05/23/2005	*85*	*87*
08/03/2005	44	6

Below the 50th Percentile of Flow

DATE	SSC (mg/L)	FLOW (cfs)	GEOMETRIC MEAN
10/30/2002	27	29	18
12/09/2002	67	70	19
02/04/2003	25	68	20
05/13/2003	<5	67	76
09/15/2003	32	23	*593*
11/03/2003	92	15	*643*
07/27/2004	4560	70	NA
10/27/2004	9499	67	NA
08/03/2005	44	6	NA

The flows highlighted in purple, were above 78 cfs, and therefore, were excluded from the geometric mean calculation. A geometric mean was then calculated using the remaining data. Two exceedances of the geometric mean standard occurred and are shown in red numbers (Geometric mean of 32, 92, 4560, 9499 = 593; Geometric mean of 92, 4560, 9499, and 44 = 643).

Interpreting Other Water Quality Related Data

To use chemical data to interpret narrative criteria, EPA's CALM document (2002) encourages states to develop implementation procedures, often referred to as translators, to explain how different types of data (e.g., contaminated sediment, fish tissue concentration, bioassessment, physical integrity data, ambient toxicity) are used to make attainment-impairment decisions based on narrative criteria. EPA further encourages that these procedures be made available for review and comment by the public.

Arizona's TMDL statute precludes the use of evidence of narrative standards violation prior to developing and adopting the companion implementation procedures. Similarly, use of numeric data without directly applicable numeric standards is precluded without implementation procedures (e.g., chlorophyll-*a,* trophic status).

In some instances, screening values or "triggers" are needed to evaluate whether the concentration of a pollutant in fish tissue, sediment, or even the water column is high enough to indicate possible impacts to humans, plants, or animals under narrative standards, where numeric standards are not available. Other than establishing guidance on the use of fish consumption advisories for assessment and listing decisions (*Guidance: Use of Fish and Shellfish advisories and Classifications in 303(d) and 305(b) Listing Decisions*, EPA, OWOW and OST, October 24, 2000), EPA has left it up to the state to individually establish such standards through a public forum.

Arizona is in the process of developing several procedural documents. As needed, portions of these documents will also be adopted into either the Surface water Quality Standards or the Impaired Water Identification Rule. The narrative

implementation procedures will identify the screening values to be used, the basis of these values, and the actions that should be taken based on exceeding these values to further evaluate potential impacts.

As appropriate screening values and translators have not completed a public review process in Arizona, much of the "other" readily available water quality-related data could not be directly used for this assessment, because there is not a clear link to an adopted numeric water quality criteria. However, such information is used in the weight-of-evidence approach to support listing and delisting decisions.

EPA routinely asks to review such data when it reviews Arizona's 303(d) List of impaired waters, and amends Arizona's list according to federal assessment criteria. EPA has published methods for monitoring and assessing such data as part of its Regional Environmental Monitoring and Assessment Program (REMAP) protocols and procedures; however, it defers to state methods where they have been adopted.

Fish Tissue and Sediment Data

Some chemical pollutants concentrate in fish and shellfish by accumulating in fatty tissue or selectively binding to muscle tissue. Generally these pollutants cannot be detected in the water column or in bottom sediments, but do bioaccumulate over time in aquatic life and species that prey on aquatic life. The bioaccumulation poses a threat to human health if the organisms are eaten on a regular basis in excess of the federal fish consumption advisory levels. In January 2001, EPA issued a national advisory concerning risks associated with mercury in freshwater fish, especially for women who are pregnant or may become pregnant, nursing mothers, and young children.

As with all types of "other" data, at this time, Arizona does not have numeric standards for fish tissue or sediment data, and until adoption cannot use these data for impairment listing decisions. Numeric fish tissue standards and narrative implementation procedures for fish consumption advisories and evaluation of fish tissue data have been drafted. Until the procedures are adopted into rule, data related to fish tissue and sediment can be included in the assessment report for informational purposes only. It should be noted, however, that EPA added several assessment units in both 2002 and 2004 based on fish consumption advisories. It is anticipated that EPA will take the same action for the 2006 list, so an appropriate comment is provided in the integrated assessment report where these over-filings are anticipated.

In cooperation with the Arizona Game and Fish Department and using an EPA grant, ADEQ has completed several studies investigating human health risks associated with eating fish caught in a cross-section of Arizona's lakes. The sampling was conducted on lakes which were chosen due to present or historic mining, the presence of predatory fish, and the level or recreational fishing pressure the lake receives. Additional sampling and analysis will depend on interagency cooperation due to access, logistics, and budget issues. ADEQ continues to investigate opportunities to combine resources from multiple programs and agencies to expand this Priority Pollutant Program statewide.

Swimming Area Closures, Fish Kills, and Drinking Water Advisories

In previous assessments, ADEQ has used issuance of swimming beach closures, documentation of fish kills, or issuance of a drinking water advisory on an assessment unit used for domestic water supply as indications of impairment. These advisories are not, however, issued by the Department; therefore, criteria for determining these may vary. Until narrative implementation procedures are developed regarding the issuance of such notices or how to evaluate fish kills and abnormalities, such information is included in the assessment report for informational purposes, but cannot be used as the sole basis in determining impairment.

Bioassessments and Habitat Assessments

ADEQ has been developing its Biocriteria Program since the early 1990s. In 1997 and 1998, ADEQ published its warmwater and coldwater indices of biological integrity based on macroinvertebrate communities. Although the index provides a score for macroinvertebrate health, how the score will be used to establish that the community is impaired needs to be developed through a public process. Also the indices need to be related to existing narrative standards such as those established for toxics and excess bottom deposits/sediments.

ADEQ's macroinvertebrate indices were developed for riffles during spring monitoring periods using ADEQ protocols, in predominantly cobble streams. Macroinvertebrate data collected during different seasons, in polls, using other methods, or in wetland or sand-dominated habitats cannot be applied to these indices. Therefore, the indices of biological integrity developed by ADEQ may not apply to data collected by other monitoring entities. Having invested over 10 years in development of this program, the Department seeks EPA's support of these efforts and discourages the use of data and

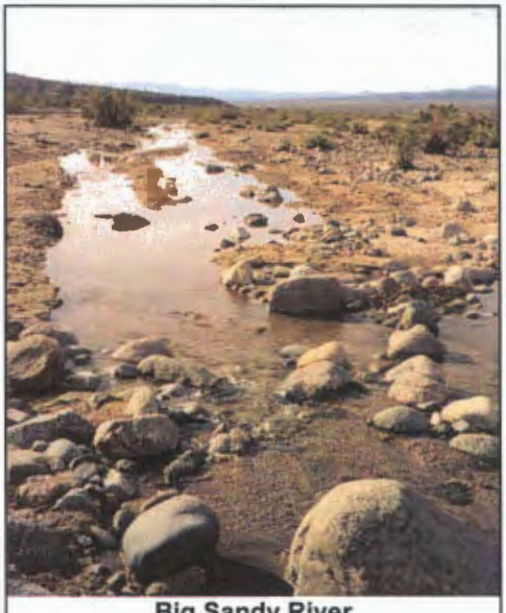
protocols that have not been evaluated for accuracy or applicability under Arizona conditions. Similar questions and problems must be resolved before algal or fish community data can be applied to assessments.

The narrative biocriteria implementation procedures will establish methods to differentiate whether the impairment is solely related to natural conditions (e.g., flood, drought, travertine, bedrock scouring) or related to anthropogenic causes. Preliminary assessments have shown that habitat measurements at each site must be reviewed to determine whether the indices of biological integrity would be applicable, as some habitats render the data unusable. For example, stream channels composed of bedrock or travertine may be unsuitable for establishing and maintaining a thriving macroinvertebrate community. The habitat can also become impaired due to natural conditions such as flood scouring the area or drought causing the stream to become temporarily dry.

As needed, portions of the procedures may be adopted into either the Surface Water Quality Standards or the Impaired Water Identification Rule. This will allow ADEQ to properly apply biocriteria to future assessments. Narrative biocriteria and implementation procedures are being proposed during the current Triennial Review, but have not yet been adopted, so were not used for this assessment.

Fluvial Geomorphology Surveys

ADEQ has been conducting research projects to determine how Rosgen's geomorphology methods could be used to evaluate natural stream channel stability. The research to date has been largely funded by EPA's Wetlands Grants and an Arizona Water Protection Fund Grant. The results of these grants are several geomorphology research reports that have been published by and for ADEQ, including those reports listed below. The final product for the EPA Wetlands Grant is development of "sediment rating curves" for the West Fork Black River and Beaver Creek in the upper Salt River Basin. ADEQ is also required under the Wetlands Grant to develop a standard operating procedures document for geomorphologic surveys and develop a five-year geomorphology research plan.


Big Sandy River

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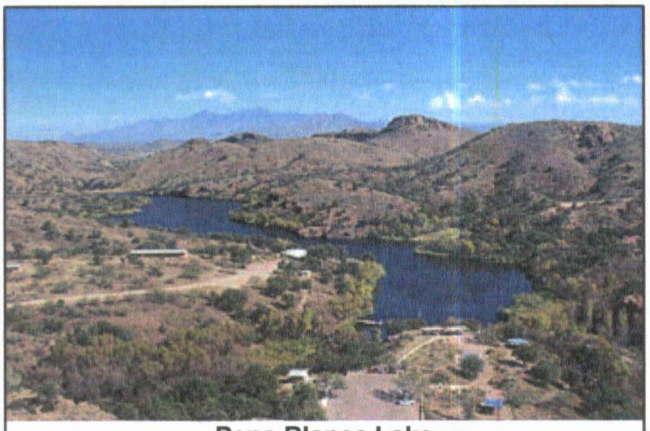
Other Physical Integrity Data

ADEQ has been collecting a wide variety of physical integrity data, in part to determine habitat condition to support bioassessments. ADEQ is proposing to use one measurement, the percentage of fine sediments in riffle/run habitats in perennial streams to determine compliance with the narrative bottom deposits standards. A narrative implementation procedures document has been drafted but has not been approved, so was not used for this assessment.

Lake Survey Data

ADEQ has a draft narrative nutrient implementation procedures document that would use a matrix of lake measurements to determine whether a lake is receiving excess nutrients and is in violation of the narrative nutrient standard. If adopted, lake quality data would be compared to a matrix table of values. A combination of elevated values and exceedances of threshold values would be used to determine impairment. The threshold values applied would depend on the lake classification: deep, shallow, igneous, sedimentary, and urban. Lake measurements used to evaluate narrative nutrients include:

- Chlorophyll_a
- Secchi depth
- Blue-green algae (per milliliter and percent of total count)
- Total phosphorus
- Total nitrogen or total Kjeldahl nitrogen
- Dissolved oxygen
- pH
- Fish kills attributed to low dissolved oxygen, high pH, or ammonia toxicity
- Fish kills or other aquatic organism mortality attributed to algal toxicity
- Nuisance algal blooms
- Submerged aquatic vegetation



Pena Blanca Lake

What if No Water Quality Criteria Apply?

It is possible for an assessment unit in Arizona to not have designated uses. Standards do not apply to the following surface waters (unless they are specifically named in the Surface Water Quality Standards):

- A lake constructed outside of a natural water channel (e.g., many urban lakes);
- A hydrologically isolated tributary, not a tributary to a surface water named in the standards (i.e., it drains into Mexico, a neighboring state, or a playa);
- A surface water located on a tribal reservation, in Mexico, or in an adjacent state;
- A manmade conveyance for surface water (e.g., drainage ditches, runoff detention basins, storm water sewers, some canals).

It is also possible to collect water quality data for parameters that don't have standards (e.g., alkalinity, total dissolved solids, and radon). As standards are based on designated uses, even commonly used standards may not apply to an assessment unit.

The U.S. Geological Survey collects a significant amount of data that do not have associated water quality standards. Those data are not used for assessments. If no standards could be applied to the data collected, the site is not included in the monitoring data tables. For example, if only total dissolved solids, specific conductance, and radon were collected, the monitoring sites are not included in Arizona's assessment because no adopted standards apply. Tracking of such data and monitoring sites is an added resource effort that has little value added at this time. If and when the surface water database can handle input of all relevant water quality information, tracking of these data and sites may be a worthwhile exercise.

The Former Turbidity Standard

Use in Assessments – The turbidity standard was replaced by the suspended sediment concentration (SSC) standard in 2002. At that time, little SSC data had been collected. Therefore, during a transition period, turbidity, total suspended solids, and SSC data were routinely collected by ADEQ staff and contractors. This data was reviewed during this assessment to determine where exceedances of the turbidity standard could be used to predict exceedances of the SSC standard.

A relationship between turbidity and SSC is not directly apparent for several reasons. One reason is that the turbidity standard applies to all flows, while the SSC standard applies only during normal or base flow conditions. Therefore, SSC data associated with many turbidity exceedances cannot be used for calculating the geometric mean because the data was collected during higher flows.

Another reason is that two turbidity standards applied to streams (10 NTU for coldwater streams and 50 NTU for warmwater streams), while only one SSC standard currently applies to all surface waters (80 mg/L). A second SSC standard is proposed during the current triennial Review of 25 mg/L in coldwater streams, but was not used for this assessment.

Finally, an SSC standard was not adopted for lakes, while there had been two turbidity standards for lakes (10 NTU for coldwater lakes and 25 NTU for warmwater lakes). Narrative nutrient implementation procedures will use Secchi depth, algal blooms, algal growth, and plant growth to more directly measure lake conditions when the implementation procedures are adopted.

In the 2004 and 2006 assessment, listing decisions were based solely on SSC data. Turbidity data was used only to screen sites for future implementation of narrative nutrients, narrative bottom deposits, or biocriteria implementation procedures, or to recommend future SSC monitoring. Any assessment unit that would have been assessed as impaired based on the former turbidity standard was assessed as inconclusive and placed on the Planning List.

Use in Delisting Decisions – In the 2004 assessment, surface waters previously listed due to turbidity exceedances, and where a TMDL had not yet been completed, were placed on the Planning List for collection of SSC data. Determining that a surface water is *no longer impaired* after a turbidity TMDL was established, however, has been a thorny issue. The main problem has been that the turbidity TMDLs established critical conditions at flows above base or normal flows, when the SSC standards cannot be applied. Another problem for the Department has been potential revisions to SSC standards and the potential addition of narrative implementation procedures and biocriteria that, once adopted, might show that the assessment unit is impaired.

For the 2006 assessment where there is sufficient SSC data to show that the current SSC standard (80 mg/L) is not being exceeded during normal flows, and the proposed SSC standard (25 mg/L) also would not be exceeded, ADEQ is recommending delisting the assessment unit, as it is no longer impaired. This decision should also be supported by evidence of watershed improvement activities. These decisions to delist are tempered by a caution that the assessment unit may be relisted when biocriteria and other narrative standards are adopted.

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APPENDIX G1
SELECTED ARIZONA SURFACE WATER QUALITY STANDARDS

Narrative and numeric surface water quality standards are established in the Arizona Administrative Code R18-11-101 through 123, including Appendix A and B (revised 2002). A complete copy of these standards can be obtained through the Secretary of State's Office or downloaded from their web site at: http://www.azsos.gov/public_services/table_of_contents.htm.

The abridged version provided in this appendix includes the numeric standard used in this assessment, but excludes many human-made compounds (e.g., volatile and semi-volatile organic compounds and pesticides) and it does not include the list of surface waters and designated uses.

PARAMETER	FRACTION	DESIGNATED USE (Or Site-Specific Standard)	ACUTE OR SINGLE SAMPLE MAXIMUM CRITERIA	CHRONIC CRITERIA
Ammonia (NH_3)	Total	A&Wc/A&Ww	Varies by pH., see published standards	Varies by temperature and pH, see published standards
Antimony (Sb)	Dissolved	A&Wc/A&Ww A&Wedw	88 µg/L 1,000 µg/L	30 µg/L 600 µg/L
	Total	DWS FBC/PBC FC	6 µg/L 560 µg/L 4,300 µg/L	NA NA NA
Arsenic (As)	Dissolved	A&Wc/A&Ww/A&Wedw A&We	360 µg/L 440 µg/L	190 µg/L NA
	Total	DWS/FBC AGL PBC FC AGI People's Canyon Creek	50 µg/L 200 µg/L 420 µg/L 1450 µg/L 2,000 µg/L 20 µg/L	NA NA NA NA NA NA
Barium (Ba)	Dissolved	FBC/PBC	98,000 µg/L	NA
	Total	DWS	2,000 µg/L	
Beryllium (Be)	Dissolved	A&Wc/A&Ww/A&Wedw	65 µg/L	5.3 µg/L
	Total	DWS FC PBC/FBC	4 µg/L 1,130 µg/L 2,800 µg/L	NA NA NA
Boron (B)	Total	DWS AGI FBC/PBC	630 µg/L 1,000 µg/L 126,000 µg/L	NA
Cadmium (Cd)	Dissolved	A&W	Varies by hardness*, see published standards.	Varies by hardness*, see published standards.
	Total	DWS FC Agl/AgL FBC/PBC	5 µg/L 84 µg/L 50 µg/L 700 µg/L	NA
Chlorine (total residual) (Cl)	Total	A&Wc/A&Ww/A&Wedw DWS FBC/PBC	11 µg/L 700 µg/L 140,000 µg/L	5 µg/L NA NA

PARAMETER	FRACTION	DESIGNATED USE (Or Site-Specific Standard)	ACUTE OR SINGLE SAMPLE MAXIMUM CRITERIA	CHRONIC CRITERIA
Chromium (Cr)	Dissolved	West Fork Little Colorado River, above Government Springs Oak Creek and West Fork Oak Creek	10 µg/L 5 µg/L	
	Total	DWS/FBC/PBC AgI/AgL	100 µg/L 1,000 µg/L	NA NA
Chromium III (Cr III)	Dissolved	A&Ww/A&Wc/A&We/A&Wedw	Varies by hardness*, see published standards.	Varies by hardness*, see published standards.
	Total	DWS FC FBC/PBC	10,500 µg/L 1,010,000 µg/L 2,100,000 µg/L	NA NA NA
Chromium VI (Cr VI)	Dissolved	A&Wc/A&Ww/A&Wedw/ A&We	16 µg/L 34 µg/L	11 µg/L NA
	Total	DWS FC FBC/PBC	21 2,000 µg/L 4,200 µg/L	NA NA NA
Copper (Cu)	Dissolved	A&Ww/A&Wc/A&We/A&Wedw	Varies by hardness*, see published standards.	Varies by hardness*, see published standards.
		Rio de Flag below WWTP outfall	36 µg/L	
	Total	AgL DWS/FBC/PBC AgI	500 µg/L 1,300 µg/L 5,000 µg/L	NA NA NA
Cyanide (Cn)	Total	A&Wc A&Ww/A&Wedw A&We AgL, DWS FBC/PBC FC	22 µg/L 41 µg/L 84 µg/L 200 µg/L 28,000 µg/L 215,000 µg/L	5.2 µg/L 9.7 µg/L NA NA NA NA
Dissolved Oxygen (DO)	Total	A&Ww A&Wc A&Wedw (In compliance is percent saturation is > 90%)	>6.0 mg/L >7.0 mg/L >3.0 mg/L (3 hours after sunrise) >1.0 mg/L (at sunset)	NA NA NA
	Total	West Fork Little Colorado Peoples Canyon Creek Cienega Creek Bonita Creek	no decrease due to discharge	
DDE (metabolite of DDT)	Total	AgI, AgL, FC DWS A&Wc A&Ww, A&Wedw A&We FBC/PBC	0.001 0.1 1.1 µg/L 1.1 µg/L 1.1 µg/L 4.1	NA NA 0.001 0.02 NA NA
Escherichia coli	Total	FBC PBC	235 CFU/100ml 576 CFU/100ml	Geometric mean standard, using 4 consecutive samples: FBC = 126 CFU/100 ml PBC = 126 CFU/100 ml
Fluoride (F)	Total	DWS FBC/PBC	4,000 µg/L(4 mg/L) 84,000 µg/L(84 mg/L)	NA NA
Lead (Pb)	Dissolved	A&Ww/A&Wc/A&We/A&Wedw	Standard varies by water hardness*, see published standards	Standard varies by hardness*, see published standards.
	Total	DWS/ FBC/PBC AgL AgI	15 µg/L 100 µg/L 10,000 µg/L	NA NA NA

PARAMETER	FRACTION	DESIGNATED USE (Or Site-Specific Standard)	ACUTE OR SINGLE SAMPLE MAXIMUM CRITERIA	CHRONIC CRITERIA
Manganese (Mn)	Total	DWS AgI FBC/PBC People's Canyon Creek, Burro Creek, and Francis Creek	980 µg/L 10,000 µg/L 196,000 µg/L 500 µg/L	NA NA NA NA
Mercury (Hg)	Dissolved	A&Wc/A&Ww A&Wedw A&We	2.4 µg/L 2.6 µg/L 5.0 µg/L	0.01 µg/L 0.2 µg/L NA
	Total	FC DWS AgL FBC/PBC	0.6 µg/L 2 µg/L 10 µg/L 420 µg/L	NA NA NA NA
Nickel (Ni)	Dissolved	A&W	Varies by hardness*, see published standards.	Varies by hardness*, see published standards.
	Total	DWS FC FBC/PBC	140 µg/L 4,600 µg/L 28,000 µg/L	NA NA NA
Nitrate (as nitrogen) (NO3)	Total	DWS San Pedro (Curtiss-Benson) FBC/PBC	10 mg/L 10 mg/L 2,240 mg/L	NA NA NA
Nitrite/Nitrate (as nitrogen) (NO_2/NO_2)	Total	DWS	10 mg/L	NA
Nitrite (as nitrogen) (NO_2)	Total	DWS FBC/PBC	1 mg/L 140 mg/L	NA NA
Nitrogen (N)	Total	See nutrient chart below		
pH		A&W/FBC/PBC/AgL DWS AgI All waters except Unique Waters Unique Waters: Bonita Creek, Cienega Creek, West Fork Little Colorado, Oak Creek, and West Fork Oak Creek	6.5 - 9.0 5.0 - 9.0 4.5 - 9.0 Maximum change due to discharge = 0.5 No change due to discharge	
Phosphorus (P)	Total	See nutrient chart below		
Selenium (Se)	Total	A&Ww/A&Wc AgI A&We A&Wedw AgL/DWS FBC/PBC FC	20 µg/L 20 µg/L 33 µg/L 50 µg/L 50 µg/L 7,000 µg/L 9,000 µg/L	2 µg/L NA NA 2 µg/L NA NA NA
Silver (Ag)	Dissolved	A&Ww/A&Wc/A&We/A&Wedw	Standard varies by water hardness*, see published standards.	Standard varies by hardness*, see published standards.
	Total	DWS FBC/PBC FC	35 µg/L 7,000 µg/L 107,700 µg/L	NA NA NA
Suspended Sediment Concentration	Total	A&Wc, A&Ww (streams only – at or near base flow)	Geometric mean (4 sample minimum) 80 mg/L	
Sulfides (S2)	Total	A&W	100 µg/L(0.1 mg/L) applies only in upper layer in a lake	NA
Temperature		A&Wc	1.0 E C	

PARAMETER	FRACTION	DESIGNATED USE (Or Site-Specific Standard)	ACUTE OR SINGLE SAMPLE MAXIMUM CRITERIA	CHRONIC CRITERIA
(maximum increase due to discharge)		A&Ww/A&Wedw Bonita Creek, Cienega Creek, West Fork Little Colorado, and People's Canyon	3.0 E C no increase due to discharge	NA
Thallium (Tl)	Dissolved	A&Wc/A&Ww/A&Wedw	700 µg/L	150 µg/L
	Total	DWS FC FBC/PBC	2 µg/L 7.2 µg/L 112 µg/L	NA
Total Dissolved Solids (TDS)	Total	Colorado River below Hoover Dam below Parker Dam at Imperial Dam	NA	(flow-weighted average annual) 723 mg/L 747 mg/L 879 mg/L
	Total	West Fork Little Colorado River, Bonita Creek, & Cienega Creek	no increase due to discharge	NA
Turbidity	Total	Oak Creek Peoples Canyon Creek Cienega Creek Bonita Creek	3 NTU change due to discharge 5 NTU change due to discharge 10 NTU 15 NTU	NA
	Total	Former Standards A&Wc (lakes and streams) A&Ww (lakes) A&Ww and A&Wedw (streams)	Former standards 10 NTU 25 NTU 50 NTU	
Uranium (Ur)	Dissolved	DWS	35 µg/L	NA
Zinc (Zn)	Dissolved	A&Ww/A&Wc/A&We/A&Wedw	Varies by hardness*, see published standards.	Varies by hardness*, see published standards.
	Total	DWS AgI AgL FC FBC/PBC	2,100 µg/L 10,000 µg/L 25,000 µg/L 69,000 µg/L 420,000 µg/L	NA

*Dissolved metal standards are calculated using equations published with the surface water standards. In these equations, hardness (expressed as $CaCO_3$) cannot exceed 400 mg/L; therefore, use 400 mg/L hardness if result is greater than 400 mg/L.

NA = no applicable standards

RADIOCHEMICAL CRITERIA

Radiochemical	Designated Use	Standard (mean value)
Gross Alpha (excluding radon and uranium)	DWS	15 pCi/L
Radium-226 + Radium-228	DWS	5 pCi/L
Strontium 90	DWS	8 pCi/L
Tritium	DWS	20,000 pCi/L

SITE SPECIFIC NUTRIENT CRITERIA

	NUTRIENT	ANNUAL MEAN	90th PERCENTILE	SINGLE SAMPLE MAXIMUM
Verde River and tributaries above Bartlett Lake	Phosphorus	0.10 mg/L	0.30 mg/L	1.00 mg/L
	Nitrogen	1.00 mg/L	1.50 mg/L	3.00 mg/L
Oak Creek including West Fork (in Verde Watershed)	Phosphorus	0.10 mg/L	0.25 mg/L	0.30 mg/L
	Nitrogen	1.00 mg/L	1.50 mg/L	2.50 mg/L
Black River and Tonto Creek and their tributaries (in Salt Watershed)	Phosphorus	0.10 mg/L	0.20 mg/L	0.80 mg/L
	Nitrogen	0.50 mg/L	1.00 mg/L	2.00 mg/L
Salt River and tributaries, except Pinal Creek, from confluence of Black and White rivers to Roosevelt Lake	Phosphorus	0.12 mg/L	0.30 mg/L	1.00 mg/L
	Nitrogen	0.60 mg/L	1.20 mg/L	2.00 mg/L
Salt River below Stewart Mountain Dam to confluence with Verde River (In Salt Watershed)	Phosphorus	0.05 mg/L	NNS	0.20 mg/L
	Nitrogen	0.60 mg/L	NNS	3.00 mg/L
Roosevelt, Apache, Canyon, and Saguaro lakes Samples must be composites at 2-meter and 5-meter depth. (In Salt Watershed)	Phosphorus	0.03 mg/L	NNS	0.60 mg/L
	Nitrogen	0.30 mg/L	NNS	1.0 mg/L
Little Colorado River and tributaries above River Reservoir in Greer; South Fork Little Colorado River above South Fork Campground; and Water Canyon Creek above USFS boundary	Phosphorus	0.08 mg/L	0.10 mg/L	0.75 mg/L
	Nitrogen	0.60 mg/L	0.75 mg/L	1.10 mg/L
Little Colorado River at Apache County Road Number 124	Phosphorus	NNS	NNS	0.75 mg/L
	Nitrogen	NNS	NNS	1.80 mg/L
Little Colorado River from Amity Ditch diversion near Arizona Highway 273 to Lyman Lake (only when < 50 NTU)	Phosphorus	0.20 mg/L	0.30 mg/L	0.75 mg/L
	Nitrogen	0.70 mg/L	1.20 mg/L	1.50 mg/L
Colorado River at Mexico/US Northern International Border near Morales Dam	Phosphorus	NNS	0.33 mg/L	NNS
	Nitrogen	NNS	2.50 mg/L	NNS
San Pedro River from Curtis to Benson	Phosphorus	NNS	NNS	NNS
	Nitrogen	NNS	NNS	10 mg/L Nitrate (as N)

Appendix G2
TMDL Statute

Arizona's TMDL statute, adopted in July 2000, identifies the process by which ADEQ will make impaired waters listing decisions and develop Total Maximum Daily Loads (TMDLs) as required by the federal Clean Water Act § 303(d). A copy of this statute (Arizona Revised Statutes Title 49, Chapter 2, Article 2.1) can be downloaded at the Secretary of State Office web site at http://www.azleg.gov/ArizonaRevisedStatutes.asp.

§49-231. Definitions

In this article, unless the context otherwise requires:

1. "Impaired water" means a navigable water for which credible scientific data exists that satisfies the requirements of § 49-232 and that demonstrates that the water should be identified pursuant to 33 United States Code § 1313(d) and the regulations implementing that statute.
2. "Surface water quality standard" means a standard adopted for a navigable water pursuant to § 49-221 and 49-222 and § 303(c) of the Clean Water Act (33 United States Code § 1313(c)).
3. "TMDL implementation plan" means a written strategy to implement a total maximum daily load that is developed for an impaired water. TMDL implementation plans may rely on any combination of the following components that the Department determines will result in achieving and maintaining compliance with applicable surface water quality standards in the most cost-effective and equitable manner:
    a) Permit limitations.
    b) Best management practices.
    c) Education and outreach efforts.
    d) Technical assistance.
    e) Cooperative agreements, voluntary measures and incentive-based programs.
    f) Load reductions resulting from other legally required programs or activities.
    g) Land management programs.
    h) Pollution prevention planning, waste minimization or pollutant trading agreements.
    i) Other measures deemed appropriate by the Department.
4. "Total maximum daily load" means an estimation of the total amount of a pollutant from all sources that may be added to a water while still allowing the water to achieve and maintain applicable surface water quality standards. Each total maximum daily load shall include allocations for sources that contribute the pollutant to the water, as required by § 303(d) of the Clean Water Act (33 United States Code § 1313(d)) and regulations implementing that statute to achieve applicable surface water quality standards.

§49-232. Lists of impaired waters; data requirements; rules

A. At least once every five years, the Department shall prepare a list of impaired waters for the purpose of complying with § 303(d) of the Clean Water Act (33 United States Code § 1313(d)). The Department shall provide public notice and allow for comment on a draft list of impaired waters prior to its submission to the United States Environmental Protection Agency. The Department shall prepare written responses to comments received on the draft list. The Department shall publish the list of impaired waters that it plans to submit initially to the Regional Administrator and a summary of the responses to comments on the draft list in the Arizona Administrative Register at least forty-five days before submission of the list to the Regional Administrator. Publication of the list in the Arizona Administrative Register is an appealable agency action pursuant to Title 41, Chapter 6, Article 10 that may be appealed by any party that submitted written comments on the draft list. If the Department receives a notice of appeal of a listing pursuant to § 41-1092, subsection B within forty-five days of the publication of the list in the Arizona Administrative Register, the Department shall not include the challenged listing in its initial submission to the Regional Administrator. The Department may subsequently submit the challenged listing to the Regional Administrator if the listing is upheld in the Director's final administrative decision pursuant to § 41-1092.08, or if the challenge to the listing is withdrawn prior to a final administrative decision.

B. In determining whether a water is impaired, the Department shall consider only reasonably current credible and scientifically defensible data that the Department has collected or has received from another source. Results of water sampling or other assessments of water quality, including physical or biological health,

shall be considered credible and scientifically defensible data only if the Department has determined all of the following:

1. Appropriate quality assurance and quality control procedures were followed and documented in collecting and analyzing the data.
2. The samples or analyses are representative of water quality conditions at the time the data was collected.
3. The data consists of an adequate number of samples based on the nature of the water in question and the parameters being analyzed.
4. The method of sampling and analysis, including analytical, statistical and modeling methods, is generally accepted and validated in the scientific community as appropriate for use in assessing the condition of the water.

C. The Department shall adopt by rule the methodology to be used in identifying waters as impaired. The rules shall specify all of the following:

1. Minimum data requirements and quality assurance and quality control requirements that are consistent with subsection B of this section and that must be satisfied in order for the data to serve as the basis for listing and delisting decisions.
2. Appropriate sampling, analytical and scientific techniques that may be used in assessing whether a water is impaired.
3. Any statistical or modeling techniques that the Department uses to assess or interpret data.
4. Criteria for including and removing waters from the list of impaired waters, including any implementation procedures developed pursuant to subsection F of this section. The criteria for removing a water from the list of impaired waters shall not be any more stringent than the criteria for adding a water to that list.

D. In assessing whether a water is impaired, the Department shall consider the data available in light of the nature of the water in question, including whether the water is an ephemeral water. A water in which pollutant loadings from naturally occurring conditions alone are sufficient to cause a violation of applicable surface water quality standards shall not be listed as impaired.

E. If the Department has adopted a numeric surface water quality standard for a pollutant and that standard is not being exceeded in a water, the Department shall not list the water as impaired based on a conclusion that the pollutant causes a violation of a narrative or biological standard unless:

1. The Department has determined that the numeric standard is insufficient to protect water quality.
2. The Department has identified specific reasons that are appropriate for the water in question, that are based on generally accepted scientific principles and that support the Department's determination.

F. Before listing a navigable water as impaired based on a violation of a narrative or biological surface water quality standard and after providing an opportunity for public notice and comment, the Department shall adopt implementation procedures that specifically identify the objective basis for determining that a violation of the narrative or biological criterion exists. A total maximum daily load designed to achieve compliance with a narrative or biological surface water quality standard shall not be adopted until the implementation procedure for the narrative or biological surface water quality standard has been adopted.

G. On request, the Department shall make available to the public data used to support the listing of a water as impaired and may charge a reasonable fee to persons requesting the data.

H. By January 1, 2002, the Department shall review the list of waters identified as impaired as of January 1, 2000 to determine whether the data that supports the listing of those waters complies with this section. If the data that supports a listing does not comply with this section, the listed water shall not be included on future lists submitted to the United States Environmental Protection Agency pursuant to 33 United States Code § 1313(d) unless in the interim data that satisfies the requirements of this section has been collected or received by the Department.

I. The Department shall add a water to or remove a water from the list using the process described in § 49-232, subsection A outside of the normal listing cycle if it collects or receives credible and scientifically defensible data that satisfies the requirements of this section and that demonstrates that the current quality of the water is such that it should be removed from or added to the list. A listed water may no longer warrant classification as impaired or an unlisted water may be identified as impaired if the applicable surface water quality standards, implementation procedures or designated uses have changed or if there is a change in water quality.

§ 49-233. Priority ranking and schedule

A. Each list developed by the Department pursuant to § 49-232 shall contain a priority ranking of navigable waters identified as impaired and for which total maximum daily loads are required pursuant to § 49-234 and a schedule for the development of all required total maximum daily loads.

B. In the first list submitted to the United States Environmental Protection Agency after the effective date of this article, the schedule shall be sufficient to ensure that all required total maximum daily loads will be developed within fifteen years of the date the list is approved by the Environmental Protection Agency. Total maximum daily loads that are required to be developed for navigable waters that are included for the first time on subsequent lists shall be developed within fifteen years of the initial inclusion of the water on the list.

C. As part of the rule making prescribed by § 49-232, subsection C, the Department shall identify the factors that it will use to prioritize navigable waters that require development of total maximum daily loads. At a minimum and to the extent relevant data is available, the Department shall consider the following factors in prioritizing navigable waters for development of total maximum daily loads:

1. The designated uses of the navigable water.
2. The type and extent of risk from the impairment to human health or aquatic life.
3. The degree of public interest and support, or its lack.
4. The nature of the navigable water, including whether it is an ephemeral, intermittent or effluent-dependent water.
5. The pollutants causing the impairment.
6. The severity, magnitude and duration of the violation of the applicable surface water quality standard.
7. The seasonal variation caused by natural events such as storms or weather patterns.
8. Existing treatment levels and management practices.
9. The availability of effective and economically feasible treatment techniques, management practices or other pollutant loading reduction measures.
10. The recreational and economic importance of the water.
11. The extent to which the impairment is caused by discharges or activities that have ceased.
12. The extent to which natural sources contribute to the impairment.
13. Whether the water is accorded special protection under federal or state water quality law.
14. Whether action that is taken or that is likely to be taken under other programs, including voluntary programs, is likely to make significant progress toward achieving applicable standards even if a total maximum daily load is not developed.
15. The time expected to be required to achieve compliance with applicable surface water quality standards.
16. The availability of documented, effective analytical tools for developing a total maximum daily load for the water with reasonable accuracy.
17. Department resources and programmatic needs.

§ 49-234. Total maximum daily loads; implementation plans

A. The Department shall develop total maximum daily loads for those navigable waters listed as impaired pursuant to this article and for which total maximum daily loads are required to be adopted pursuant to 33 United States Code § 1313(d) and the regulations implementing that statute. The Department may estimate total maximum daily loads for navigable waters not listed as impaired pursuant to this article, for the purposes of developing information to satisfy the requirements of 33 United States Code §1313(d)(3), only after it has developed total maximum daily loads for all navigable waters identified as impaired pursuant to this article or if necessary to support permitting of new point source discharges.

B. In developing total maximum daily loads, the Department shall use only statistical and modeling techniques that are properly validated and broadly accepted by the scientific community. The modeling technique may vary based on the type of water and the quantity and quality of available data that meets the quality assurance and quality control requirements of § 49-232. The Department may establish the statistical and modeling techniques in rules adopted pursuant to § 49-232, subsection C.

C. Each total maximum daily load shall:

1. Be based on data and methodologies that comply with § 49-232.
2. Be established at a level that will achieve and maintain compliance with applicable surface water quality standards.

3. Include a reasonable margin of safety that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. The margin of safety shall not be used as a substitute for adequate data when developing the total maximum daily load.
4. Account for seasonal variations that may include setting total maximum daily loads that apply on a seasonal basis.

D. For each impaired water, the Department shall prepare a draft estimate of the total amount of each pollutant that causes the impairment from all sources and that may be added to the navigable water while still allowing the navigable water to achieve and maintain applicable surface water quality standards. In addition, the Department shall determine draft allocations among the contributing sources that are sufficient to achieve the total loadings. The Department shall provide public notice and allow for comment on each draft estimate and shall prepare written responses to comments received on the draft estimates and draft allocations. The Department shall publish the determinations of total pollutant loadings that will not result in impairment and the draft allocations among the contributing sources that are sufficient to achieve the total loading that it intends to submit initially to the Regional Administrator, along with a summary of the responses to comments on the estimated loading and allocations, in the Arizona Administrative Register at least forty-five days before submission of the loadings and allocations to the Regional Administrator. Not withstanding this subsection, draft allocations shall be submitted to the Regional Administrator only if that submission is required by the rules that implement 33 United States Code § 1313(d).

E. Publication of the loadings and allocations in the Arizona Administrative Register is an appealable agency action pursuant to Title 41, Chapter 6, Article 10 that may be appealed by any party that submitted written comments on the estimated loadings and allocations. If the Department receives a notice of appeal of a loading and allocation pursuant to § 41-1092.03 within forty-five days of the publication of the loading and allocations in the Arizona Administrative Register, the Department shall not submit the challenged loading and allocations to the Regional Administrator until either the challenge to the loading is withdrawn or the Director has made a final administrative decision pursuant to § 41-1092.08.

F. The Department shall make reasonable and equitable allocations among sources when developing total maximum daily loads. At a minimum, the Department shall consider the following factors in making allocations:
1. The environmental, economic and technological feasibility of achieving the allocation.
2. The cost and benefit associated with achieving the allocation.
3. Any pollutant loading reductions that are reasonably expected to be achieved as a result of other legally required actions or voluntary measures.

G. For each total maximum daily load, the Department shall establish a TMDL implementation plan that explains how the allocations and any reductions in existing pollutant loadings will be achieved. Any reductions in loadings from nonpoint sources shall be achieved voluntarily. The Department shall provide for public notice and comment on each TMDL implementation plan. Any sampling or monitoring components of a TMDL implementation plan shall comply with § 49-232.

H. Each TMDL implementation plan shall provide the time frame in which compliance with applicable surface water quality standards is expected to be achieved. The plan may include a phased process with interim targets for load reductions. Longer time frames are appropriate in situations involving multiple dischargers, technical, legal or economic barriers to achieving necessary load reductions, scientific uncertainty regarding data quality or modeling, significant loading from natural sources or significant loading resulting from discharges or activities that have already ceased.

I. For navigable waters that are impaired due in part to historical factors that are difficult to address, including contaminated sediments, the Department shall consider those historical factors in determining allocations for existing point source discharges of the pollutant or pollutants that cause the impairment. In developing total maximum daily loads for those navigable waters, the Department shall use a phased approach in which expected long-term loading reductions from the historical sources are considered in establishing short-term allocations for the point sources. While total maximum daily loads and TMDL implementation plans are being completed, any permits issued for the point sources are deemed consistent with this article if the permits require reasonable reductions in the discharges of the pollutants causing the impairment and are not required to include additional reductions if those reductions would not significantly contribute to attainment of surface water quality standards.

J. After a total maximum daily load and a TMDL implementation plan have been adopted for a navigable water, the Department shall review the status of the navigable water at least once every five years to determine if compliance with applicable surface water quality standards has been achieved. If compliance

with applicable surface water quality standards has not been achieved, the Department shall evaluate whether modification of the total maximum daily load or TMDL implementation plan is required.

§ 49-235. Rules
The Department shall adopt any rules necessary to implement this article.

§ 49-236. Report
By September 1, 2005, the Department shall submit a report to the Governor, the Speaker of the House of Representatives and the President of the Senate detailing progress made under this program and shall provide a copy to the Secretary of State and the Department of Library, Archives and Public Records. At a minimum, the report shall:

1. Evaluate the effectiveness of the total maximum daily load program and identify any recommended statutory changes to make the program more efficient, effective and equitable.
2. Assess the extent to which water quality problems that cannot be effectively addressed under the total maximum daily load program may be addressed under other federal or state laws.
3. Identify the number of appeals of department decisions under this article sought pursuant to title 41, chapter 6, article 10 and the disposition of those appeals, and assess the impact of those appeals on the Department's ability to administer the program effectively.

§ 49-237. Impact of successful judicial appeal of Arizona Department of Environmental Quality decision
If a person appeals to court and succeeds in overturning or modifying a final administrative decision of the Director pursuant to this article in an appeal initiated pursuant to Title 41, chapter 6, Article 10, within thirty days of the court's decision the Department shall take the steps necessary to implement the court's decision, unless the Director's decision that is overturned or modified was submitted to and approved by the Regional Administrator, in which case within thirty days of the court's decision the Department shall request that the Regional Administrator modify the approval to reflect the court's decision.

§ 49-238. Program termination
The program established by this article ends on July 1, 2010 pursuant to § 41-3102.

APPENDIX G3
IMPAIRED WATER IDENTIFICATION RULE

Arizona's Impaired Water Identification Rule established methods and criteria for identifying impaired waters and developing a Total Maximum Daily Load analysis. This rule was adopted in 2002. A copy of this rule can also be downloaded at the Secretary of States Office web site:
http://www.azsos.gov/public_services/table_of_contents.htm, as part of Title 18.

R18-11-601. Definitions

In addition to the definitions established in A.R.S. § 49-201 and 49-231, and A.A.C. R18-11-101, the following terms apply to this Article:

1. "303(d) List" means the list of surface waters or segments required under section 303(d) of the Clean Water Act and A.R.S. Title 49, Chapter 2, Article 2.1, for which TMDLs are developed and submitted to EPA for approval.
2. "Attaining" means there is sufficient, credible, and scientifically defensible data to assess a surface water or segment and the surface water or segment does not meet the definition of impaired or not attaining.
3. "AZPDES" means the Arizona Pollutant Elimination Discharge System.
4. "Credible and scientifically defensible data" means data submitted, collected, or analyzed using:
    a. Quality assurance and quality control procedures under A.A.C. R18-11-602;
    b. Samples or analyses representative of water quality conditions at the time the data were collected;
    c. Data consisting of an adequate number of samples based on the nature of the water in question and the parameters being analyzed; and
    d. Methods of sampling and analysis, including analytical, statistical, and modeling methods that are generally accepted and validated by the scientific community as appropriate for use in assessing the condition of the water.
5. "Designated use" means those uses specified in 18 A.A.C. 11, Article 1 for each surface water or segment whether or not they are attaining.
6. "EPA" means the U.S. Environmental Protection Agency.
7. "Impaired water" means a Navigable water for which credible scientific data exists that satisfies the requirements of § 49-232 and that demonstrates that the water should be identified pursuant to 33 United States Code § 1313(d) and the regulations implementing that statute. A.R.S. § 49-231(1).
8. "Laboratory detection limit" means a "Method Reporting Limit" (MRL) or "Reporting Limit" (RL). These analogous terms describe the laboratory reported value, which is the lowest concentration level included on the calibration curve from the analysis of a pollutant that can be quantified in terms of precision and accuracy.
9. "Monitoring entity" means the Department or any person who collects physical, chemical, or biological data used for an impaired water identification or a TMDL decision.
10. "Naturally occurring condition" means the condition of a surface water or segment that would have occurred in the absence of pollutant loadings as a result of human activity.
11. "Not attaining" means a surface water is assessed as impaired, but is not placed on the 303(d) List because:
    a. A TMDL is prepared and implemented for the surface water;
    b. An action, which meets the requirements of R18-11-604(D)(2)(h), is occurring and is expected to bring the surface water to attaining before the next 303(d) List submission; or
    c. The impairment of the surface water is due to pollution but not a pollutant, for which a TMDL load allocation cannot be developed.
12. "NPDES" means National Pollutant Discharge Elimination System.
13. "Planning List" means a list of surface waters and segments that the Department will review and evaluate to determine if the surface water or segment is impaired and whether a TMDL is necessary.
14. "Pollutant" means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge,

munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. 33 U.S.C. 1362(6). Characteristics of water, such as dissolved oxygen, pH, temperature, turbidity, and suspended sediment are considered pollutants if they result or may result in the non-attainment of a water quality standard.

15. "Pollution" means the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water." 33 U.S.C. 1362(19).
16. "QAP" means a quality assurance plan detailing how environmental data operations are planned, implemented, and assessed for quality during the duration of a project.
17. "Sampling event" means one or more samples taken under consistent conditions on one or more days at a distinct station or location.
18. "SAP" means a site specific sampling and analysis plan that describes the specifics of sample collection to ensure that data quality objectives are met and that samples collected and analyzed are representative of surface water conditions at the time of sampling.
19. "Spatially independent sample" means a sample that is collected at a distinct station or location. The sample is independent if the sample was collected:
    a. More than 200 meters apart from other samples, or
    b. Less than 200 meters apart, and collected to characterize the effect of an intervening tributary, outfall or other pollution source, or significant hydrographic or hydrologic change.
20. "Temporally independent sample" means a sample that is collected at the same station or location more than seven days apart from other samples.
21. "Threatened" means that a surface water or segment is currently attaining its designated use, however, trend analysis, based on credible and scientifically defensible data, indicates that the surface water or segment is likely to be impaired before the next listing cycle.
22. "TMDL" means total maximum daily load.
23. "TMDL decision" means a decision by the Department to:
    a. Prioritize an impaired water for TMDL development,
    b. Develop a TMDL for an impaired water, or
    c. Develop a TMDL implementation plan.
24. "Total maximum daily load" means an estimation of the total amount of a pollutant from all sources that may be added to a water while still allowing the water to achieve and maintain applicable surface water quality standards. Each total maximum daily load shall include allocations for sources that contribute the pollutant to the water, as required by § 303(d) of the clean water act (33 United States Code § 1313(d)) and regulations implementing that statute to achieve applicable surface water quality standards. A.R.S. § 49-231(4).
25. "Water quality standard" means a standard composed of designated uses (classification of waters), the numerical and narrative criteria applied to the specific water uses or classification, the antidegradation policy, and moderating provisions, for example, mixing zones, site-specific alternative criteria, and exemptions, in A.A.C. Title 18, Chapter 11, Article 1.
26. "WQARF" means the water quality assurance revolving fund established under A.R.S. § 49-282.

R18-11-602. Credible Data

A. Data are credible and relevant to an impaired water identification or a TMDL decision when:
    1. Quality Assurance Plan. A monitoring entity, which contribute data for an impaired water identification or a TMDL decision, provides the Department with a QAP that contains, at a minimum, the elements listed in subsections (A)(1)(a) through (A)(1)(f). The Department may accept a QAP containing less than the required elements if the Department determines that an element is not relevant to the sampling activity and that its omission will not impact the quality of the results based upon the type of pollutants to be sampled, the type of surface water, and the purpose of the sampling.
        a. An approval page that includes the date of approval and the signatures of the approving officials, including the project manager and project quality assurance manager;
        b. A project organization outline that identifies all key personnel, organizations, and laboratories involved in monitoring, including the specific roles and responsibilities of key personnel in carrying out the procedures identified in the QAP and SAP, if applicable;

c. Sampling design and monitoring data quality objectives or a SAP that meets the requirements of subsection (A)(2) to ensure that:
    i. Samples are spatially and temporally representative of the surface water,
    ii. Samples are representative of water quality conditions at the time of sampling, and
    iii. The monitoring is reproducible;
d. The following field sampling information to assure that samples meet data quality objectives:
    i. Sampling and field protocols for each parameter or parametric group, including the sampling methods, equipment and containers, sample preservation, holding times, and any analysis proposed for completion in the field or outside of a laboratory;
    ii. Field and laboratory methods approved under subsection(A)(5);
    iii. Handling procedures to identify samples and custody protocols used when samples are brought from the field to the laboratory for analysis;
    iv. Quality control protocols that describe the number and type of field quality control samples for the project that includes, if appropriate for the type of sampling being conducted, field blanks, travel blanks, equipment blanks, method blanks, split samples, and duplicate samples;
    v. Procedures for testing, inspecting, and maintaining field equipment;
    vi. Field instrument calibration procedures that describe how and when field sampling and analytical instruments will be calibrated;
    vii. Field notes and records that describe the conditions that require documentation in the field, such as weather, stream flow, transect information, distance from water edge, water and sample depth, equipment calibration measurements, field observations of watershed activities, and bank conditions. Indicate the procedures implemented for maintaining field notes and records and the process used for attaching pertinent information to monitoring results to assist in data interpretation;
    viii. Minimum training and any specialized training necessary to do the monitoring, that includes the proper use and calibration of field equipment used to collect data, sampling protocols, quality assurance/quality control procedures, and how training will be achieved;
e. Laboratory analysis methods and quality assurance/quality control procedures that assure that samples meet data quality objectives, including:
    i. Analytical methods and equipment necessary for analysis of each parameter, including identification of approved laboratory methods described in subsection (A)(5), and laboratory detection limits for each parameter;
    ii. The name of the designated laboratory, its license number, if licensed by the Arizona Department of Health Services, and the name of a laboratory contact person to assist the Department with quality assurance questions;
    iii. Quality controls that describe the number and type of laboratory quality control samples for the project, including, if appropriate for the type of sampling being conducted, field blanks, travel blanks, equipment blanks, method blanks, split samples, and duplicate samples;
    iv. Procedures for testing, inspecting, and maintaining laboratory equipment and facilities;
    v. A schedule for calibrating laboratory instruments, a description of calibration methods, and a description of how calibration records are maintained; and
    vi. Sample equipment decontamination procedures that outline specific methods for sample collection and preparation of equipment, identify the frequency of decontamination, and describe the procedures used to verify decontamination;
f. Data review, management, and use that includes the following:
    i. A description of the data handling process from field to laboratory, from laboratory to data review and validation, and from validation to data storage and use. Include the role and responsibility of each person for each step of the process, type of database or other storage used, and how laboratory and field data qualifiers are related to the laboratory result;
    ii. Reports that describe the intended frequency, content, and distribution of final

analysis reports and project status reports;

iii. Data review, validation, and verification that describes the procedure used to validate and verify data, the procedures used if errors are detected, and how data are accepted, rejected, or qualified; and

iv. Reconciliation with data quality objectives that describes the process used to determine whether the data collected meets the project objectives, which may include discarding data, setting limits on data use, or revising data quality objectives.

2. Sampling and analysis plan.
   a. A monitoring entity shall develop a SAP that contains, at a minimum, the following elements:
      i. The experimental design of the project, the project goals and objectives, and evaluation criteria for data results;
      ii. The background or historical perspective of the project;
      iii. Identification of target conditions, including a discussion of whether any weather, seasonal variations, stream flow, lake level, or site access may affect the project and the consideration of these factors;
      iv. The data quality objectives for measurement of data that describe in quantitative and qualitative terms how the data meet the project objectives of precision, accuracy, completeness, comparability, and representativeness;
      v. The types of samples scheduled for collection;
      vi. The sampling frequency;
      vii. The sampling periods;
      viii. The sampling locations and rationale for the site selection, how site locations are benchmarked, including scaled maps indicating approximate location of sites; and
      ix. A list of the field equipment, including tolerance range and any other manufacturer's specifications relating to accuracy and precision.
   b. The Department may accept a SAP containing less than the required elements if the Department determines that an element is not relevant to the sampling activity and that its omission will not impact the quality of the results based upon the type of pollutants to be samples, the type of surface water, and the purpose of the sampling.
3. [Options] The monitoring entity may include any of the following in the QAP or SAP:
   a. The name, title, and role of each person and organization involved in the project, identifying specific roles and responsibilities for carrying out the procedures identified in the QAP and SAP;
   b. A distribution list of each individual and organization receiving a copy of the approved QAP and SAP;
   c. A table of contents;
   d. A health and safety plan;
   e. The inspection and acceptance requirements for supplies;
   f. The data acquisition that describes types of data not obtained through this monitoring activity, but used in the project;
   g. The audits and response actions that describe how field, laboratory, and data management activities and sampling personnel are evaluated to ensure data quality, including a description of how the project will correct any problems identified during these assessments; and
   h. The waste disposal methods that identify wastes generated in sampling and methods for disposal of those wastes.
4. Exceptions. The Department may determine that the following data are also credible and relevant to an impaired water identification or TMDL decision when data were collected, provided the conditions in subsections (A)(5), (A)(6), and (B) are met, and where the data were collected in the surface water or segment being evaluated for impairment:
   a. The data were collected before July 12, 2002 and the Department determines that the data yield results of comparable reliability to the data collected under subsections (A)(1) and (A)(2);
   b. The data were collected after July 12, 2002 as part of an ongoing monitoring effort by a

governmental agency and the Department determines that the data yield results of comparable reliability to the data collected under subsections (A)(1) and (A)(2); or

c. The instream water quality data were or are collected under the terms of a NPDES or AZPDES permit or a compliance order issued by the Department or EPA, a consent decree signed by the Department or EPA, or a sampling program approved by the Department or EPA under WQARF or CERCLA, and the Department determines that the data yield results of comparable reliability to data collected under subsections (A)(1) and (A)(2).

5. Data collection, preservation, and analytical procedures. The monitoring entity shall collect, preserve, and analyze data using methods of sample collection, preservation, and analysis established under A.A.C. R9-14-610.
6. Laboratory. The monitoring entity shall ensure that chemical and toxicological samples are analyzed in a state-licensed laboratory, a laboratory exempted by the Arizona Department of Health Services for specific analyses, or a federal or academic laboratory that can demonstrate proper quality assurance/quality control procedures substantially equal to those required by the Arizona Department of Health Services, and shall ensure that the laboratory uses approved methods identified in A.A.C. R9-14-610.

B. Documentation for data submission. The monitoring entity shall provide the Department with the following information either before or with data submission:
1. A copy of the QAP or SAP, or both, revisions to a previously submitted QAP or SAP, and any other information necessary for the Department to evaluate the data under subsection (A)(4);
2. The applicable dates of the QAP and SAP, including any revisions;
3. Written assurance that the methods and procedures specified in the QAP and SAP were followed;
4. The name of the laboratory used for sample analyses and its certification number, if the laboratory is licensed by the Arizona Department of Health Services;
5. The quality assurance/quality control documentation, including the analytical methods used by the laboratory, method number, detection limits, and any blank, duplicate, and spike sample information necessary to properly interpret the data, if different from that stated in the QAP or SAP;
6. The data reporting unit of measure;
7. Any field notes, laboratory comments, or laboratory notations concerning a deviation from standard procedures, quality control, or quality assurance that affects data reliability, data interpretation, or data validity; and
8. Any other information, such as complete field notes, photographs, climate, or other information related to flow, field conditions, or documented sources of pollutants in the watershed, if requested by the Department for interpreting or validating data.

C. Record keeping. The monitoring entity shall maintain all records, including sample results, for the duration of the listing cycle. If a surface water or segment is added to the Planning List or to the 303(d) List, the Department shall coordinate with the monitoring entity to ensure that records are kept for the duration of the listing.

R18-11-603. General Data Interpretation Requirements

A. The Department shall use the following data conventions to interpret data for impaired water identifications and TMDL decisions:
1. Data reported below laboratory detection limits.
   a. When the analytical result is reported as <X, where X is the laboratory detection limit for the analyte and the laboratory detection limit is less than or equal to the surface water quality standard, consider the result as meeting the water quality standard:
      i. Use these statistically derived values in trend analysis, descriptive statistics or modeling if there is sufficient data to support the statistical estimation of values reported as less than the laboratory detection limit; or
      ii. Use one-half of the value of the laboratory detection limit in trend analysis, descriptive statistics, or modeling, if there is insufficient data to support the statistical estimation of values reported as less than the laboratory detection limit.
   b. When the sample value is less than or equal to the laboratory detection limit but the laboratory detection limit is greater than the surface water quality standard, shall not use the result for impaired water identifications or TMDL decisions;

2. Identify the field equipment specifications used for each listing cycle or TMDL developed. A field sample measurement within the manufacturer's specification for accuracy meets surface water quality standards;
3. Resolve a data conflict by considering the factors identified under the weight-of-evidence determination in R18-11-605(B);
4. When multiple samples from a surface water or segment are not spatially or temporally independent, or when lake samples are from multiple depths, use the following resultant value to represent the specific dataset:
    a. The appropriate measure of central tendency for the dataset for:
        i. A pollutant listed in the surface water quality standards 18 A.A.C. 11, Article 1, Appendix A, Table 1, except for nitrate or nitrate/nitrite;
        ii. A chronic water quality standard for a pollutant listed in 18 A.A.C. 11, Article 1, Appendix A, Table 2;
        iii. A surface water quality standard for a pollutant that is expressed as an annual or geometric mean;
        iv. The surface water quality standard for temperature or the single sample maximum water quality standard for suspended sediment concentration, nitrogen, and phosphorus in R18-11-109;
        v. The surface water quality standard for radiochemicals in R18-11-109(G); or
        vi. Except for chromium, all single sample maximum water quality standards in R18-11-112.
    b. The maximum value of the dataset for:
        i. The acute water quality standard for a pollutant listed in 18 A.A.C. 11, Article 1, Appendix A, Table 2 and acute water quality standard in R18-11-112;
        ii. The surface water quality standard for nitrate or nitrate/nitrite in 18 A.A.C. 11, Article 1, Appendix A, Table 1;
        iii. The single sample maximum water quality standard for bacteria in subsections R18-11-109(A); or
        iv. The 90th percentile water quality standard for nitrogen and phosphorus in R18-11-109(F) and R18-11-112.
    c. The worst case measurement of the dataset for:
        i. Surface water quality standard for dissolved oxygen under R18-11-109(E). For purposes of this subsection, worst case measurement means the minimum value for dissolved oxygen;
        ii. Surface water quality standard for pH under R18-11-109(B). For purposes of this subsection, "worst case measurement" means both the minimum and maximum value for pH.

B. The Department shall not use the following data for placing a surface water or segment on the Planning List, the 303(d) List, or in making a TMDL decision.
    1. Any measurement outside the range of possible physical or chemical measurements for the pollutant or measurement equipment,
    2. Uncorrected data transcription errors or laboratory errors, and
    3. An outlier identified through statistical procedures, where further evaluation determines that the outlier represents a valid measure of water quality but should be excluded from the dataset.
C. The Department may employ fundamental statistical tests if appropriate for the collected data and type of surface water when evaluating a surface water or segment for impairment or in making a TMDL decision. The statistical tests include descriptive statistics, frequency distribution, analysis of variance, correlation analysis, regression analysis, significance testing, and time series analysis.
D. The Department may employ modeling when evaluating a surface water or segment for impairment or in making a TMDL decision, if the method is appropriate for the type of waterbody and the quantity and quality of available data meet the requirements of R18-11-602. Modeling methods include:
    1. Better Assessment Science Integrating Source and Nonpoint Sources (BASINS),
    2. Fundamental statistics, including regression analysis,
    3. Hydrologic Simulation Program-Fortran (HSPF),
    4. Spreadsheet modeling, and
    5. Hydrologic Engineering Center (HEC) programs developed by the Army Corps of Engineers.

R18-11-604. Types of Surface Waters Placed on the Planning List and 303(d) List

A. The Department shall evaluate, at least every five years, Arizona=s surface waters by considering all readily available data.
   1. The Department shall place a surface water or segment on:
      a. The Planning List if it meets any of the criteria described in subsection (D),or
      b. The 303(d) List if it meets the criteria for listing described in subsection (E).
   2. The Department shall remove a surface water or segment from the Planning List based on the requirements in R18-11-605(E)(1) or from the 303(d) List, based on the requirements in R18-11-605(E)(2).
   3. The Department may move surface waters or segments between the Planning List and the 303(d) List based on the criteria established in R18-11-604 and R18-11-605.

B. When placing a surface water or segment on the Planning List or the 303(d) List, the Department shall list the stream reach, derived from EPA=s Reach File System *or National Hydrography Dataset*, or the entire lake, unless the data indicate that only a segment of the stream reach or lake is impaired or not attaining its designated use, in which case, the Department shall describe only that segment for listing.

C. Exceptions. The Department shall not place a surface water or segment on either the Planning List or the 303(d) List if the non-attainment of a surface water quality standard is due to one of the following:
   1. Pollutant loadings from naturally occurring conditions alone are sufficient to cause a violation of applicable water quality standards;
   2. The data were collected within a mixing zone or under a variance or nutrient waiver established in a NPDES or AZPDES permit for the specific parameter and the result does not exceed the alternate discharge limitation established in the permit. The Department may use data collected within these areas for modeling or allocating loads in a TMDL decision; or
   3. An activity exempted under R18-11-117, R18-11-118, or a condition exempted under R18-11-119.

D. Planning List.
   1. The Department shall:
      a. Use the Planning List to prioritize surface waters for monitoring and evaluation as part of the Department's watershed management approach;
      b. Provide the Planning List to EPA; and
      c. Evaluate each surface water and segment on the Planning List for impairment based on the criteria in R18-11-605(D) to determine the source of the impairment.
   2. The Department shall place a surface water or segment on the Planning List based the criteria in R18-11-605(C). The Department may also include a surface water or segment on the Planning List when:
      a. A TMDL is completed for the pollutant and approved by EPA;
      b. The surface water or segment is on the 1998 303(d) List but the dataset used for the listing:
         i. Does not meet the credible data requirements of R18-11-602, or
         ii. Contains insufficient samples to meet the data requirements under R18-11-605(D);
      c. Some monitoring data exist but there are insufficient data to determine whether the surface water or segment is impaired or not attaining, including:
         i. A numeric surface water quality standard is exceeded, but there are not enough samples or sampling events to fulfill the requirements of R18-11-605(D);
         ii. Evidence exists of a narrative standard violation, but the amount of evidence is insufficient, based on narrative implementation procedures and the requirements of R18-11-605(D)(3);
         iii. Existing monitoring data do not meet credible data requirements in R18-11-602; or
         iv. A numeric surface water quality standard is exceeded, but there are not enough sample results above the laboratory detection limit to support statistical analysis as established in R18-11-603(A)(1).
      d. The surface water or segment no longer meets the criteria for impairment based on a change in the applicable surface water quality standard or a designated use approved by EPA under section 303(c)(1) of the Clean Water Act, but insufficient current or original monitoring data exist to determine whether the surface water or segment will meet current surface water quality standards;
      e. Trend analysis using credible and scientifically defensible data indicate that surface water

quality standards may be exceeded by the next assessment cycle;

f. The exceedance of surface water quality standards is due to pollution, but not a pollutant;
g. Existing data were analyzed using methods with laboratory detection limits above the numeric surface water quality standard but analytical methods with lower laboratory detection limits are available;
h. The surface water or segment is expected to attain its designated use by the next assessment as a result of existing or proposed technology-based effluent limitations or other pollution control requirements under local, state, or federal authority. The appropriate entity shall provide the Department with the following documentation to support placement on the Planning List:
    i. Verification that discharge controls are required and enforceable;
    ii. Controls are specific to the surface water or segment, and pollutant of concern;
    iii. Controls are in place or scheduled for implementation; and
    iv. There are assurances that the controls are sufficient to bring about attainment of water quality standards by the next 303(d) List submission; or
i. The surface water or segment is threatened due to a pollutant and, at the time the Department submits a final 303(d) List to EPA, there are no federal regulations implementing section 303(d) of the Clean Water Act that require threatened waters be included on the list.

E. 303(d) List. The Department shall:
1. Place a surface water or segment on the 303(d) List if the Department determines:
    a. Based on R18-11-605(D), that the surface water or segment is impaired due to a pollutant and that a TMDL decision is necessary; or
    b. That the surface water or segment is threatened due to a pollutant and, at the time the Department submits a final 303(d) List to EPA, there are federal regulations implementing section 303(d) of the Clean Water Act that require threatened waters be included on the list.
2. Provide public notice of the 303(d) List according to the requirements of A.R.S. § 49-232 and submit the 303(d) List according to section 303(d) of the Clean Water Act.

R18-11-605. Evaluating A Surface Water or Segment For Listing and Delisting

A. The Department shall compile and evaluate all reasonably current, credible, and scientifically defensible data to determine whether a surface water or segment is impaired or not attaining.
B. Weight-of-evidence approach.
1. The Department shall consider the following concepts when evaluating data:
    a. Data or information collected during critical conditions may be considered separately from the complete dataset, when the data show that the surface water or segment is impaired or not attaining its designated use during those critical conditions, but attaining its uses during other periods. Critical conditions may include stream flow, seasonal periods, weather conditions, or anthropogenic activities;
    b. Whether the data indicate that the impairment is due to persistent, seasonal, or recurring conditions. If the data do not represent persistent, recurring, or seasonal conditions, the Department may place the surface water or segment on the Planning List;
    c. Higher quality data over lower quality data when making a listing decision. Data quality is established by the reliability, precision, accuracy, and representativeness of the data, based on factors identified in R18-11-602(A) and (B), including monitoring methods, analytical methods, quality control procedures, and the documented field and laboratory quality control information submitted with the data. The Department shall consider the following factors when determining higher quality data:
        i. The age of the measurements. Newer measurements are weighted heavier than older measurements, unless the older measurements are more representative of critical flow conditions;
        ii. Whether the data provide a direct measure of an impact on a designated use. Direct measurements are weighted heavier than measurements of an indicator or surrogate parameter; or
        iii. The amount or frequency of the measurements. More frequent data collection are

weighted heavier than nominal datasets.

2. The Department shall evaluate the following factors to determine if the water quality evidence supports a finding that the surface water or segment is impaired or not attaining:
    a. An exceedance of a numeric surface water quality standard based on the criteria in subsections (C)(1), (C)(2), (D)(1), and (D)(2);
    b. An exceedance of a narrative surface water quality standard based on the criteria in subsections (C)(3) and (D)(3);
    c. Additional information that determines whether a water quality standard is exceeded due to a pollutant, suspected pollutant, or naturally occurring condition:
        i. Soil type, geology, hydrology, flow regime, biological community, geomorphology, climate, natural process, and anthropogenic influence in the watershed;
        ii. The characteristics of the pollutant, such as its solubility in water, bioaccumulation potential, sediment sorption potential, or degradation characteristics, to assist in determining which data more accurately indicate the pollutant's presence and potential for causing impairment; and
        iii. Available evidence of direct or toxic impacts on aquatic life, wildlife, or human health, such as fish kills and beach closures, where there is sufficient evidence that these impacts occurred due to water quality conditions in the surface water.
    d. Other available water quality information, such as NPDES or AZPDES water quality discharge data, as applicable.
    e. If the Department determines that a surface water or segment does not merit listing under numeric water quality standards based on criteria in subsections (C)(1), (C)(2), (D)(1), or (D)(2) for a pollutant, but there is evidence of a narrative standard exceedance in that surface water or segment under subsection (D)(3) as a result of the presence of the same pollutant, the Department shall list the surface water or segment as impaired only when the evidence indicates that the numeric water quality standard is insufficient to protect the designated use of the surface water or segment and the Department justifies the listing based on any of the following:
        i. The narrative standard data provide a more direct indication of impairment as supported by professionally prepared and peer-reviewed publications;
        ii. Sufficient evidence of impairment exists due to synergistic effects of pollutant combinations or site-specific environmental factors; or
        iii. The pollutant is bioaccumulative, relatively insoluble in water, or has other characteristics that indicate it is occurring in the specific surface water or segment at levels below the laboratory detection limits, but at levels sufficient to result in an impairment.
3. The Department may consider a single line of water quality evidence when the evidence is sufficient to demonstrate that the surface water or segment is impaired or not attaining.

C. Planning List.

1. When evaluating a surface water or segment for placement on the Planning List.
    a. Consider at least ten spatially or temporally independent samples collected over three or more temporally independent sampling events; and
    b. Determine numeric water quality standards exceedances. The Department shall:
        i. Place a surface water or segment on the Planning List following subsection (B), if the number of exceedances of a surface water quality standard is greater than or equal to the number listed in Table 1, which provides the number of exceedances that indicate a minimum of a 10 percent exceedance frequency with a minimum of a 80 percent confidence level using a binomial distribution for a given sample size; or
        ii. For sample datasets exceeding those shown in **Table 1**, calculate the number of exceedances using the following equation: (X∃x* *n* , *p*) where *n* = number of samples; *p* = exceedance probability of 0.1; *x* = smallest number of exceedances required for listing with "*n*" samples; and confidence level ∃ 80 percent.
2. When there are less than ten samples, the Department shall place a surface water or segment on the Planning List following subsection (B), if three or more temporally independent samples exceed the following surface water quality standards:
    a. The surface water quality standard for a pollutant listed in 18 A.A.C. 11, Article 1, Appendix

A, Table 1, except for nitrate or nitrate/nitrite;

b. The surface water quality standard for temperature or the single sample maximum water quality standard for suspended sediment concentration, nitrogen, and phosphorus in R18-11-109;
c. The surface water quality standard for radiochemicals in R18-11-109(G);
d. The surface water quality standard for dissolved oxygen under R18-11-109(E);
e. The surface water quality standard for pH under R18-11-109(B); or
f. The following surface water quality standards in R18-11-112:
    i. Single sample maximum standards for nitrogen and phosphorus,
    ii. All metals except chromium, or
    iii. Turbidity.

3. The Department shall place a surface water or segment on the Planning List if information in subsections (B)(2)(c), (B)(2)(d), and (B)(2)(e) indicates that a narrative water quality standard violation exists, but no narrative implementation procedure required under A.R.S. § 49-232(F) exists to support use of the information for listing.

D. 303(d) List.

1. When evaluating a surface water or segment for placement on the 303(d) List.
    a. Consider at least 20 spatially or temporally independent samples collected over three or more temporally independent sampling events; and
    b. Determine numeric water quality standards exceedances. The Department shall:
        i. Place a surface water or segment on the 303(d) List, following subsection (B), if the number of exceedances of a surface water quality standard is greater than or equal to the number listed in Table 2, which provides the number of exceedances that indicate a minimum of a 10 percent exceedance frequency with a minimum of a 90 percent confidence level using a binomial distribution, for a given sample size; or
        ii. For sample datasets exceeding those shown in Table 2, calculate the number of exceedances using the following equation: ($X \exists x^* n, p$) where n = number of samples; p = exceedance probability of 0.1; x = smallest number of exceedances required for listing with "n" samples; and confidence level ∃ 90 percent.
2. The Department shall place a surface water or segment on the 303(d) List, following subsection (B) without the required number of samples or numeric water quality standard exceedances under subsection (D)(1), if either the following conditions occur:
    a. More than one temporally independent sample in any consecutive three-year period exceeds the surface water quality standard in:
        i. The acute water quality standard for a pollutant listed in 18 A.A.C. 11, Article 1, Appendix A, Table 2 and the acute water quality standards in R18-11-112;
        ii. The surface water quality standard for nitrate or nitrate/nitrite in 18 A.A.C. 11, Article 1, Appendix A, Table 1; or
        iii. The single sample maximum water quality standard for bacteria in subsections R18-11-109(A).
    b. More than one exceedance of an annual mean, 90th percentile, aquatic and wildlife chronic water quality standard, or a bacteria 30-day geometric mean water quality standard occurs, as specified in R18-11-109, R18-11-110, R18-11-112, or 18 A.A.C. 11, Article 1, Appendix A, Table 2.
3. Narrative water quality standards exceedances. The Department shall place a surface water or segment on the Planning List if the listing requirements are met under A.R.S. § 49-232(F).

E. Removing a surface water, segment, or pollutant from the Planning List or the 303(d) List.

1. Planning List. The Department shall remove a surface water, segment, or pollutant from the Planning List when:
    a. Monitoring activities indicate that:
        i. There is sufficient credible data to determine that the surface water or segment is impaired under subsection (D), in which case the Department shall place the surface water or segment on the 303(d) List. This includes surface waters with an EPA approved TMDL when the Department determines that the TMDL strategy is insufficient for the surface water or segment to attain water quality standards; or
        ii. There is sufficient credible data to determine that the surface water or segment is

attaining all designated uses and standards.

b. All pollutants for the surface water or segment are delisted.

2. 303(d) List. The Department shall:
   a. Remove a pollutant from a surface water or segment from the 303(d) List based on one or more of the following criteria:
      i. The Department developed, and EPA approved, a TMDL for the pollutant;
      ii. The data used for previously listing the surface water or segment under R18-11-605(D) is superseded by more recent credible and scientifically defensible data meeting the requirements of R18-11-602, showing that the surface water or segment meets the applicable numeric or narrative surface water quality standard. When evaluating data to remove a pollutant from the 303(d) List, the monitoring entity shall collect the more recent data under similar hydrologic or climatic conditions as occurred when the samples were taken that indicated impairment, if those conditions still exist;
      iii. The surface water or segment no longer meets the criteria for impairment based on a change in the applicable surface water quality standard or a designated use approved by EPA under section 303(c)(1) of the Clean Water Act;
      iv. The surface water or segment no longer meets the criteria for impairment for the specific narrative water quality standard based on a change in narrative water quality standard implementation procedures;
      v. A re-evaluation of the data indicate that the surface water or segment does not meet the criteria for impairment because of a deficiency in the original analysis; or
      vi. Pollutant loadings from naturally occurring conditions alone are sufficient to cause a violation of applicable water quality standards;
   b. Remove a surface water, segment, or pollutant from the 303(d) List, based on criteria that are no more stringent than the listing criteria under subsection (D);
   c. Remove a surface water or segment from the 303(d) List if all pollutants for the surface water or segment are removed from the list;
   d. Remove a surface water, segment, or pollutant, from the 303(d) List and place it on the Planning List, if:
      i. The surface water, segment or pollutant was on the 1998 303(d) List and the dataset used in the original listing does not meet the credible data requirements under R18-11-602, or contains insufficient samples to meet the data requirements under subsection (D); or
      ii. The monitoring data indicate that the impairment is due to pollution, but not a pollutant.

R18-11-606. TMDL Priority Criteria for 303(d) Listed Surface Waters or Segments

A. In addition to the factors specified in A.R.S. § 49-233(C), the Department shall consider the following when prioritizing an impaired water for development of TMDLs:
   1. A change in a water quality standard;
   2. The date the surface water or segment was added to the 303(d) List;
   3. The presence in a surface water or segment of species listed as threatened or endangered under section 4 of the Endangered Species Act;
   4. The complexity of the TMDL;
   5. State, federal, and tribal policies and priorities; and
   6. The efficiencies of coordinating TMDL development with the Department's surface water monitoring program, the watershed monitoring rotation, or with remedial programs.

B. The Department shall prioritize an impaired surface water or segment for TMDL development based on the factors specified in A.R.S. § 49-233(C) and subsection (A) as follows:
   1. Consider an impaired surface water or segment a high priority if:
      a. The listed pollutant poses a substantial threat to the health and safety of humans, aquatic life, or wildlife based on:
         i. The number and type of designated uses impaired;
         ii. The type and extent of risk from the impairment to human health, aquatic life, or

wildlife;
iii. The pollutant causing the impairment, or
iv. The severity, magnitude, and duration the surface water quality standard was exceeded;

b. A new or modified individual NPDES or AZPDES permit is sought for a new or modified discharge to the impaired water;
c. The listed surface water or segment is listed as a unique water in A.A.C. R18-11-112 or is part of an area classified as a "wilderness area," "wild and scenic river," or other federal or state special protection of the water resource;
d. The listed surface water or segment contains a species listed as threatened or endangered under the federal Endangered Species Act and the presence of the pollutant in the surface water or segment is likely to jeopardize the listed species;
e. A delay in conducting the TMDL could jeopardize the Department's ability to gather sufficient credible data necessary to develop the TMDL;
f. There is significant public interest and support for the development of a TMDL;
g. The surface water or segment has important recreational and economic significance to the public; or
h. The pollutant is listed for eight years or more.

2. Consider an impaired surface water or segment a medium priority if:
   a. The surface water or segment fails to meet more than one designated use;
   b. The pollutant exceeds more than one surface water quality standard;
   c. A surface water quality standard exceedance is correlated to seasonal conditions caused by natural events, such as storms, weather patterns, or lake turnover;
   d. It will take more than two years for proposed actions in the watershed to result in the surface water attaining applicable water quality standards;
   e. The type of pollutant and other factors relating to the surface water or segment make the TMDL complex; or
   f. The administrative needs of the Department, including TMDL schedule commitments with EPA, permitting requirements, or basin priorities that require completion of the TMDL.
3. Consider an impaired surface water or segment a low priority if:
   a. The Department has formally submitted a proposal to delist the surface water, segment ,or pollutant to EPA based on R18-11-605(E)(2). If the Department makes the submission outside the listing process cycle, the change in priority ranking will not be effective until EPA approves the submittal;
   b. The Department has modified, or formally proposed for modification, the designated use or applicable surface water quality standard, resulting in an impaired water no longer being impaired, but the modification has not been approved by EPA;
   c. The surface water or segment is expected to attain surface water quality standards due to any of the following:
      i. Recently instituted treatment levels or best management practices in the drainage area,
      ii. Discharges or activities related to the impairment have ceased, or
      iii. Actions have been taken and controls are in place or scheduled for implementation that will likely to bring the surface water back into compliance;
   d. The surface water or segment is ephemeral or intermittent. The Department shall re-prioritize the surface water or segment if the presence of the pollutant in the listed water poses a threat to the health and safety of humans, aquatic life, or wildlife using the water, or the pollutant is contributing to the impairment of a downstream perennial surface water or segment;
   e. The pollutant poses a low ecological and human health risk;
   f. Insufficient data exist to determine the source of the pollutant load;
   g. The uncertainty of timely coordination with national and international entities concerning international waters;
   h. Naturally occurring conditions are a major contributor to the impairment; and
   i. No documentation or effective analytical tools exist to develop a TMDL for the surface water or segment with reasonable accuracy.

C. The Department will target surface waters with high priority factors in subsections (B)(1)(a) through (B)(1)(d) for initiation of TMDLs within two years following EPA approval of the 303(d) List.
D. The Department may shift priority ranking of a surface water or segment for any of the following reasons:
   1. A change in federal, state, or tribal policies or priorities that affect resources to complete a TMDL;
   2. Resource efficiencies for coordinating TMDL development with other monitoring activities, including the Department=s ambient monitoring program that monitors watersheds on a 5-year rotational basis;
   3. Resource efficiencies for coordinating TMDL development with Department remedial or compliance programs;
   4. New information is obtained that will revise whether the surface water or segment is a high priority based on factors in subsection (B); and
   5. Reduction or increase in staff or budget involved in the TMDL development.
E. The Department may complete a TMDL initiated before July 12, 2002 for a surface water or segment that was listed as impaired on the 1998 303(d) List but does not qualify for listing under the criteria in R18-11-605, if:
   1. The TMDL investigation establishes that the water quality standard is not being met and the allocation of loads is expected to bring the surface water into compliance with standards,
   2. The Department estimates that more than 50 percent of the cost of completing the TMDL has been spent,
   3. There is community involvement and interest in completing the TMDL, or
   4. The TMDL is included within an EPA-approved state workplan initiated before July 12, 2002.

Table 1 – [Planning List] Minimum Number of Samples Exceeding the Numeric Standard

Number of Samples		Number of Samples Exceeding Standard	Number of Samples		Number of Samples Exceeding Standard	Number of Samples		Number of Samples Exceeding Standard
From	To		From	To		From	To	
10	15	3	182	190	23	368	376	43
16	23	4	191	199	24	377	385	44
24	31	5	200	208	25	386	395	45
32	39	6	209	218	26	396	404	46
40	47	7	219	227	27	405	414	47
48	56	8	228	236	28	415	423	48
57	65	9	237	245	29	424	432	49
66	73	10	246	255	30	433	442	50
74	82	11	256	264	31	443	451	51
83	91	12	265	273	32	452	461	52
92	100	13	274	282	33	462	470	53
101	109	14	283	292	34	471	480	54
110	118	15	293	301	35	481	489	55
119	126	16	302	310	36	490	499	56
127	136	17	311	320	37	500		57
137	145	18	321	329	38	See calculation in R18-11-605.C.1.b.ii if dataset is larger than 500 samples.		
146	154	19	330	338	39			
155	163	20	339	348	40			
164	172	21	349	357	41			
173	181	22	358	367	42			

Table 2 – [Impaired Waters] Minimum Number of Samples Exceeding the Numeric Standard

Number of Samples		Number of Samples Exceeding Standard	Number of Samples		Number of Samples Exceeding Standard	Number of Samples		Number of Samples Exceeding Standard
From	To		From	To		From	To	
20	25	5	183	191	25	362	370	45
26	32	6	192	199	26	371	379	46
33	40	7	200	208	27	380	388	47
41	47	8	209	217	28	389	397	48
48	55	9	218	226	29	398	406	49
56	63	10	227	235	30	407	415	50
64	71	11	236	244	31	416	424	51
72	79	12	245	253	32	425	434	52
80	88	13	254	262	33	435	443	53
89	96	14	263	270	34	444	452	54
97	104	15	271	279	35	453	461	55
105	113	16	280	288	36	462	470	56
114	121	17	289	297	37	471	479	57
122	130	18	298	306	38	480	489	58
131	138	19	307	315	39	490	498	59
139	147	20	316	324	40	499	500	60
148	156	21	325	333	41	See calculation in R18-11-605.D.1.b.ii if dataset is larger than 500 samples.		
157	164	22	334	343	42			
165	173	23	344	352	43			
174	182	24	353	361	44			

Appendix G4
Acronyms, Abbreviations, and Definitions

AAC	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
AGFD	Arizona Game and Fish Department
Agricultural Irrigation (AgI)	Surface water is used for the irrigation of crops.
Agricultural Livestock Watering (AgL)	Surface water is used as a supply of water for consumption by livestock.
Aquatic and Wildlife Coldwater Fishery (A&Wc)	Surface water used by animals, plants, or other organisms (including salmonid fish) for habitation, growth, or propagation, generally occurring above 5000 feet elevation.
Aquatic and Wildlife Effluent Dependent Water (A&Wedw)	Surface water that consists of discharges of treated wastewater that is classified as an effluent dependent water by ADEQ under R18-11-113 of the Arizona Administrative Code. An effluent dependent water, without the discharge of treated wastewater, would be an ephemeral water. This surface water is used by animals, plants, or other organisms for habitation, growth, or propagation.
Aquatic and Wildlife Ephemeral (A&We)	Surface water that has a channel that is at all times above the water table, and that flows only in direct response to precipitation. Ephemeral water is used by animals, plants, or other organisms (excluding fish) for habitation, growth, or propagation.
Aquatic and Wildlife Warmwater Fishery (A&Ww)	Surface water used by animals, plants, or other organisms (excluding salmonid fish) for habitation, growth, or propagation, generally occurring at elevations less than 5000 feet.
BEHI	Bank erosion hazard index.
Biological Communities	Groups of fish, macroinvertebrates, algae, or riparian vegetation occupying a habitat or area.
BLM	United States Bureau of Land Management
Body Contact	(See Full Body Contact and Partial Body Contact)
BoR	United States Bureau of Reclamation
CERCLA	Comprehensive Environmental Response Compensation and Liability Act. EPA's Superfund Program.
Core Parameters	Although all parameters with numeric standards are used for assessments, there needs to be at least three sampling events with these specified parameters to assess a designated use as "attaining." This specified parametric coverage does not need to be available to assess a designated use as "impaired."
Credible Data	Surface water monitoring data that is collected meeting requirements established in the Impaired Water Identification Rule (R18-11-602). These requirements include collecting and analyzing data using a Quality Assurance Plan, Sampling and Analysis Plan, approved methods, approved laboratory, and adequately trained personnel.

Designated Uses	Designated uses are specified for stream segments and lakes in the surface water rules (Arizona Administrative Code R18-11-104). Surface waters not listed in the rules obtain their designated uses through the "Tributary Rule". Arizona's surface water designated uses include: **Aquatic and Wildlife** **Coldwater Fishery** (A&Wc) **Warmwater Fishery** (A&Ww) **Ephemeral Stream** (A&We) **Effluent Dependent Water** (A&Wedw), **Domestic Water Source** (DWS), **Fish Consumption** (FC), **Full Body Contact** (FBC) (i.e., swimming), **Partial Body Contact** (PBC) (i.e., non-swimming recreation), **Agricultural Irrigation** (AgI), and **Agricultural Livestock Watering** (AgL).
Designated Use Support	**Attaining** - Surface water quality standards are being met based on a minimum of 3 monitoring events that provide seasonal representation and core parametric coverage. **Threatened** - Surface water quality standards are currently being met, but a trend analysis indicates that the surface water is likely to be impaired before the next assessment. **Impaired** - Surface water quality standards are not being met based on sufficient number of samples to meet the test of impairment identified in the Impaired Waters Identification Rule **(Appendix B)**. **Inconclusive** - Monitoring or other assessment information available is insufficient to assess the surface water as "attaining," "threatened," or "impaired."
Domestic Water Source (DWS)	Surface water is used as a potable water supply. Coagulation, sedimentation, filtration, disinfection or other treatments may be necessary to yield a finished water suitable for human consumption.
Effluent Dependent Water	(See Aquatic and Wildlife Effluent Dependent Water)
EMAP	US Environmental Protection Agency's Environmental Monitoring and Assessment Project.
EPA or USEPA	The United States Environmental Protection Agency
Ephemeral Flow	(See Aquatic and Wildlife Ephemeral Water)
Exceed/Exceedance	Monitoring data results were above a maximum water quality criterion or below a minimum water quality criterion.
Fish Consumption (FC)	Surface water is used by humans for harvesting aquatic organisms for consumption. Harvestable aquatic organisms include, but are not limited to, fish, clams, crayfish, and frogs.
Full Body Contact (FBC)	Surface water use causes the human body to come into direct contact with the water to the point of complete submergence (e.g., swimming). Assumes that some ingestion is likely to occur and sensitive body organs (e.g., eyes, ears, or nose) may be exposed to direct contact with the water
IBWC	International Boundary and Water Commission, an international commission established to resolve water quality issues along the United States border with Mexico.
Intermittent Flow	Surface water flows continuously only at certain times of the year, as when it receives water from springs or from some surface source such as melting snow (i.e., seasonal).
Macroinvertebrates	Stream bottom dwelling insects and other organisms that inhabit freshwater habitats for at least part of their life cycle and are retained by a mesh screen size greater than 0.2 millimeters.
Narrative Water Quality Standards	(R18-11-108) Surface waters will be free from pollutants in amounts or combinations that: - Settle to form bottom deposits that impair aquatic life or recreational uses; - Cause an objectionable odor; - Cause an off-taste or odor in drinking water; - Cause an off-flavor in aquatic organisms or waterfowl; - Are "toxic" to humans, animals, plants, or other organisms; - Cause the growth of algae or aquatic plants that impair aquatic life or recreational uses; - Cause or contribute to a violation of an aquifer water quality standard (R18-11-405

	through 406); or - Change the color of the surface water from natural background levels.
NAWQA	The US Geological Survey's National Water Quality Assessment Program.
Nonpoint Source	These sources of pollutants come from non-discrete discharges such as atmospheric deposition, contaminated sediment, and land uses that generate polluted runoff like agriculture, urban land development, forestry, construction, and on-site sewage disposal systems. Nonpoint source pollution also encompasses activities that either change the natural flow regime of a stream or wetland or result in habitat disturbance.
NPDES / AZPDES	National Pollutant Discharge Elimination System is a federal point source discharge permit. ADEQ has obtained primacy for this program, which uses the acronym AZPDES in describing this permit.
Partial Body Contact (PBC)	Surface water is used so that the human body comes into direct contact with the water, but normally not at the point of complete submergence (i.e., non-swimming recreation). The use is such that ingestion of the water is not likely to occur, nor will sensitive body organs (e.g., eyes, ears, or nose) normally be exposed to direct contact with the water.
Perennial Flow	Surface water that flows continuously.
Point Source	These sources of pollution are discrete, identifiable sources such as pipes or ditches that are primarily associated with industries and municipal sewage treatment plants. (See nonpoint source.)
Public Water Supply	A water system which conveys water for human consumption to 15 or more service connections or serves an average of at least 25 persons per day (as defined by the federal Safe Drinking Water Act).
QAP	Quality Assurance Plan. This is a written plan detailing how environmental data will be collected, analyzed, assessed for quality, and establishes the data quality objectives that the data must meet.
Reach	A segment of a stream. EPA originally divided Arizona's streams on the USGS hydrology at 1:100,000 scale map into reaches based on hydrological features such as tributaries. ADEQ has further subdivided these reaches based on changes in designated use support and water quality.
Sampling Event	A "sampling event" is one or more samples taken under consistent conditions on one or more consecutive days at a specific location.
SAP	Sampling and Analysis Plan. This is a written site-specific plan to ensure that samples collected and analyzed meet data quality objectives and are representative of surface water conditions at the time of sampling.
Surface Water	These are "waters of the United States", which include: - All waters which are, have been, or could be used for interstate or foreign commerce; - All interstate waters or wetlands; - All lakes, reservoirs, natural ponds, rivers, streams (including intermittent and ephemeral streams), creeks, washes, draws, mudflats, sandflats, wetlands, backwaters, playas (etc.) which could be used by visitors to our state for recreation, from which fish or shellfish could be taken or sold, or which is used for industrial purposes; or - All impoundments, wetlands, or tributaries of above waters. (Summarized from Arizona Administrative Code R18-11-101)
Toxic Chemicals	Pollutants or combinations of pollutants which, after discharge and exposure (contact, ingestion, inhalation, or assimilation) to any organism (either directly from the environment or indirectly through the food chain), may cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations in such organisms or offspring.
TMDL	Total Maximum Daily Load. A TMDL is a written, quantitative plan and analysis to determine the maximum loading on a pollutant basis that a surface water can assimilate and still attain and maintain a specific water quality standard during all conditions. The TMDL allocates the loading capacity of the surface water to point sources and nonpoint sources identified in the watershed, accounting for natural background levels and seasonal variation, with an allocation

	set aside as a margin of safety.

Tributary Rule	This rule (Arizona Administrative Code R18-11-105, amended in 2002) is used to determine "Designated Uses" for surface waters not specifically listed in the surface water protection rules. Uses are assigned as follows: • Ephemeral waters are assigned the Aquatic and Wildlife ephemeral and Partial Body Contact uses only. • Perennial and intermittent waters are assigned Fish Consumption, Full Body Contact, and Aquatic and Wildlife coldwater (A&Wc) if above 5,000 feet or warmwater (A&Ww) if below 5,000 feet elevation. Agricultural uses and Domestic Water Source are not applied to these waters.
Trophic Status	Lakes can be classified by the level of nutrients available for primary biological production. Lakes generally progress through the following trophic phases or states: **Oligotrophic** -- Low algal or plant productivity; **Mesotrophic** -- Medium algal or plant productivity; **Eutrophic** -- High algal or plant productivity; and productivity; **Hypereutrophic** -- Very high algal or plant productivity and light limited. That is, instead of growth being limited by nutrient availability (as it is in other trophic conditions), growth becomes limited by light.
Unique Water	A surface water classified as an outstanding state resource water under Arizona Administrative Code R18-11-112.
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
USGS	United States Geological Survey
UST	Underground Storage Tanks Program for eliminating the release of toxic chemicals from storage tanks.
Waters of the United States	(See "surface water" definition.)
WTP	Water Treatment Plant for drinking water treatment.
WWTP	Wastewater Treatment Plant

UNITS OF MEASUREMENT AND CONVERSIONS

MEASUREMENT USE	UNIT	EQUIVALENT UNITS OR CONVERSION
Bacteria concentration in water	colony forming units (CFU) per 100 milliliter	
Chemical concentrations in water	milligram per liter (mg/L) microgram per liter (µg/L)	1 mg/L = 0.001 grams per liter 1 mg/L = parts per million (ppm) 1 µg/L = 0.001 milligram per liter (mg/l) 1 µg/L = 0.000001 grams per liter 1 µg/L = 1 parts per billion (ppb)
Chemical concentrations in animal tissue and sediment	milligram per kilogram (mg/kg) microgram per kilogram (µg/kg)	1 mg/kg = 1 parts per million (ppm) 1 mg/kg = 1 microgram per gram (µg/g) 1 µg/kg = 1 parts per billion (ppb)
Ground water quantity	acre-feet	1 acre-foot = 325,900 gallons
pH in water	standard unit (SU)	
Radiochemical concentrations in water	picocuries per liter (pCi/L)	
Rate of flow	cubic feet per second (cfs)	1 cfs = 448.83 gallons per minute (gpm) 1 cfs = 646,000 gallons per day (gpd)
Lake area	acres	
Stream length	miles	1 mile = 1.6 kilometers (km)
Watershed size	square miles	1 square mile = 640 acres per square mile
Water turbidity (ability of light to travel through the water)	Nephelometric Turbidity Unit (NTU)	